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United States Department of Agriculture

Forest Service

Southwestern Region

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November 2013

Draft Environmental Impact Statement for the Coconino National Forest Land and Resource Management Plan, Volume 3

Coconino, Gila, and Yavapai Counties, Arizona

Printed on recycled paper – November 2013

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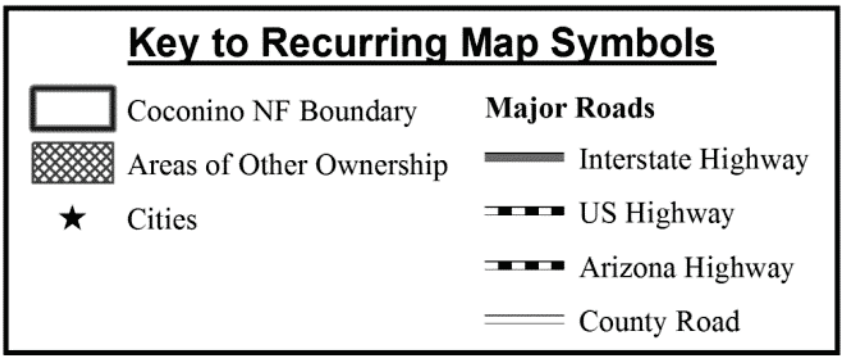

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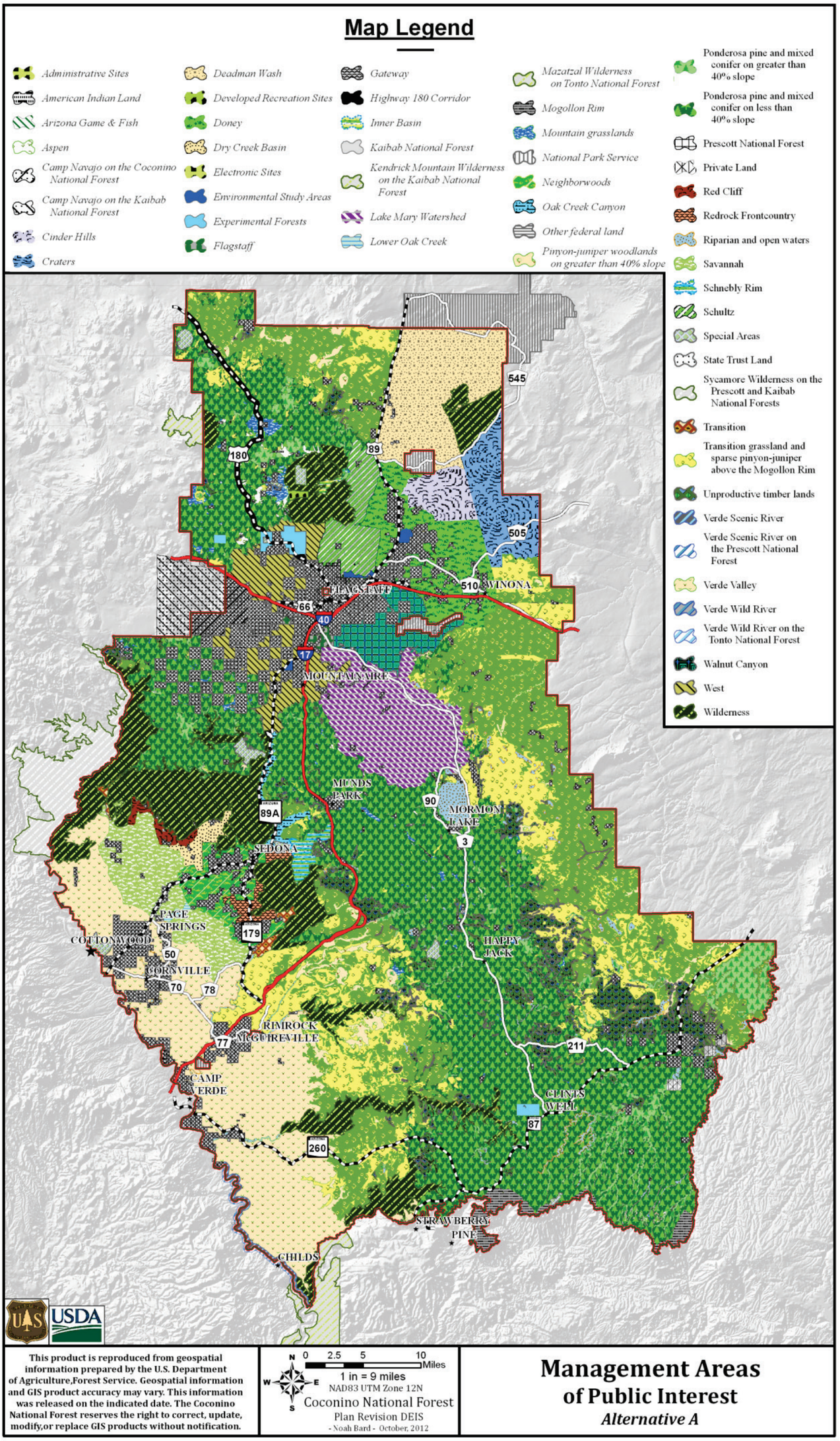

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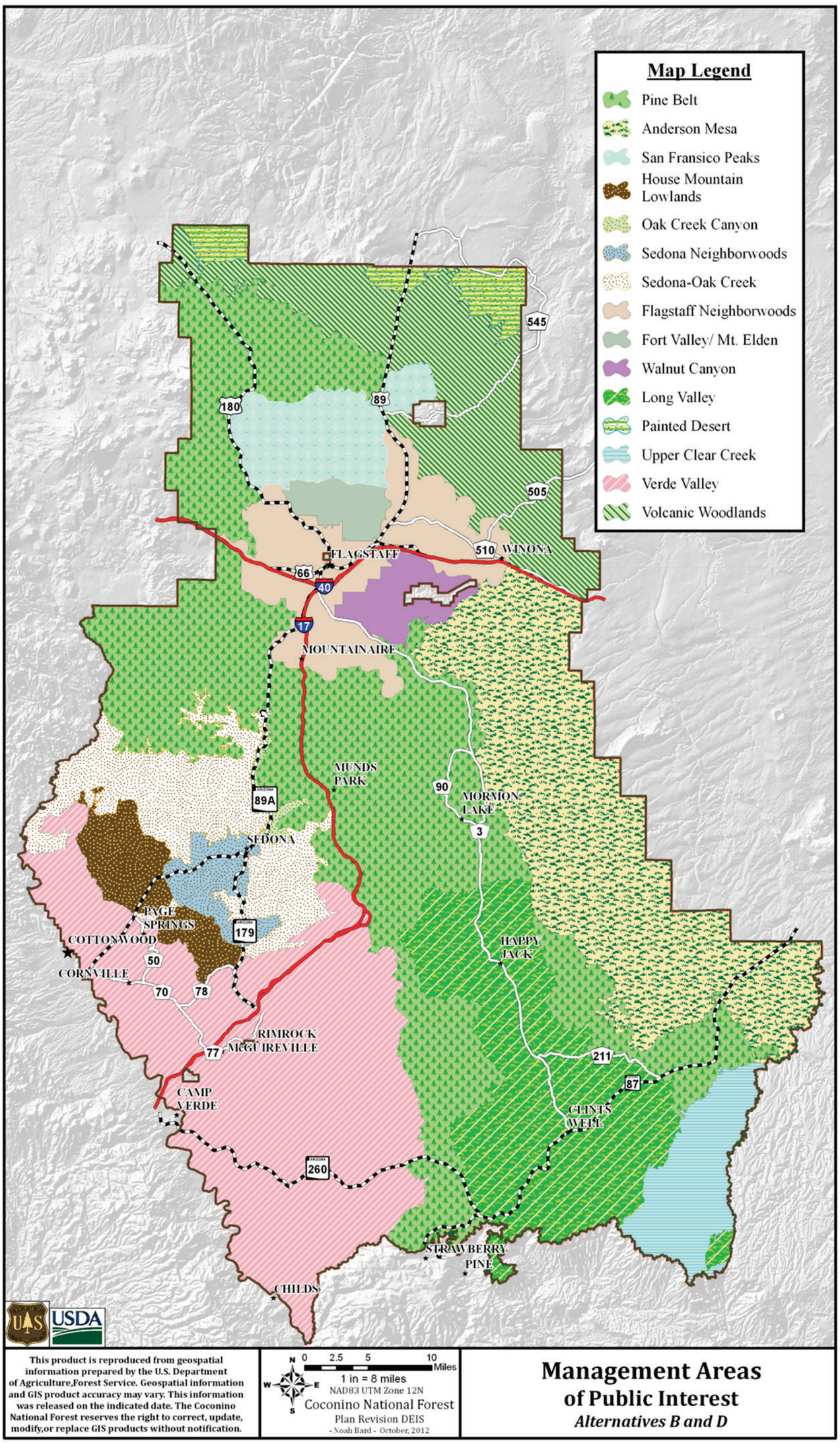

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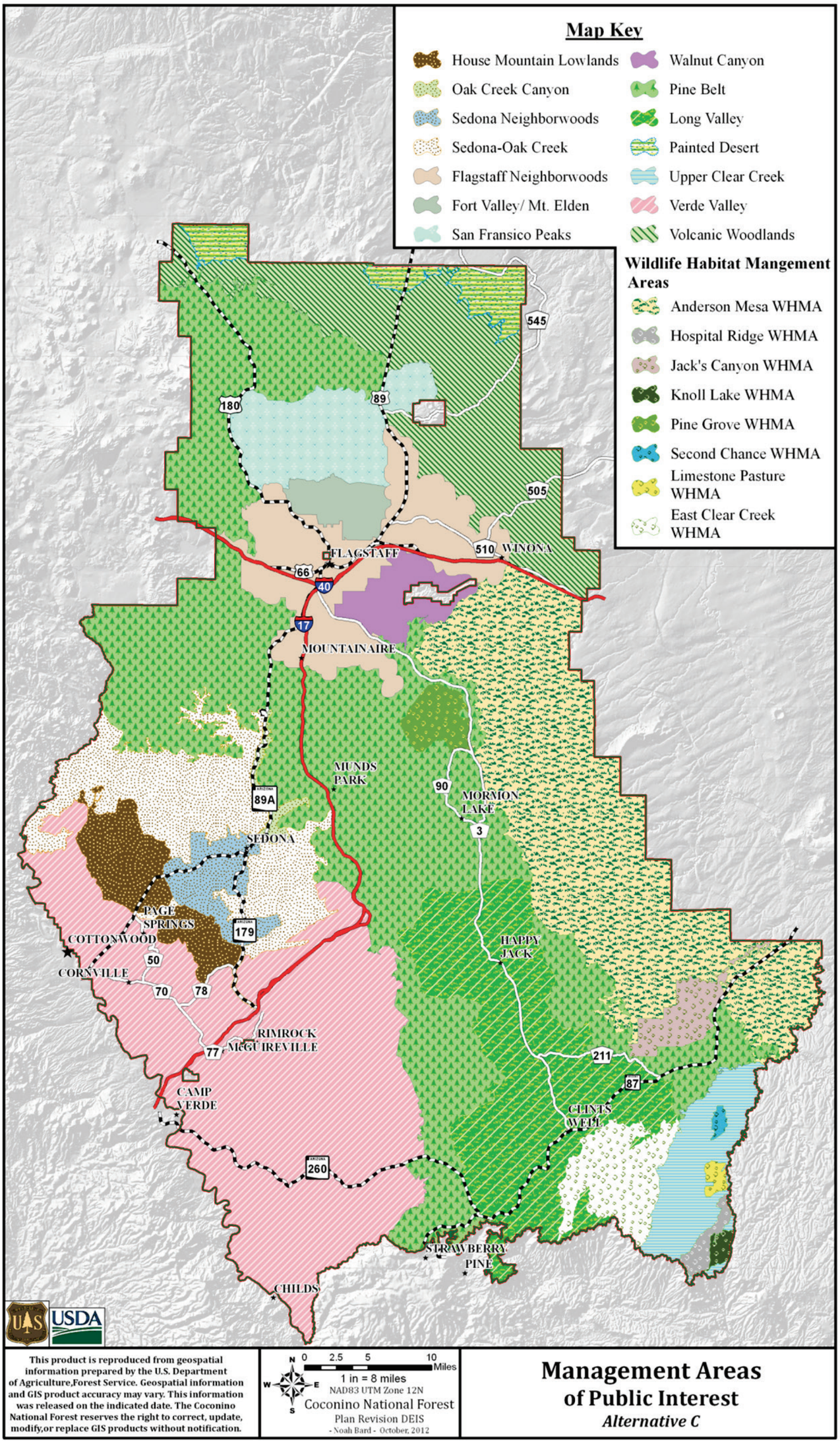

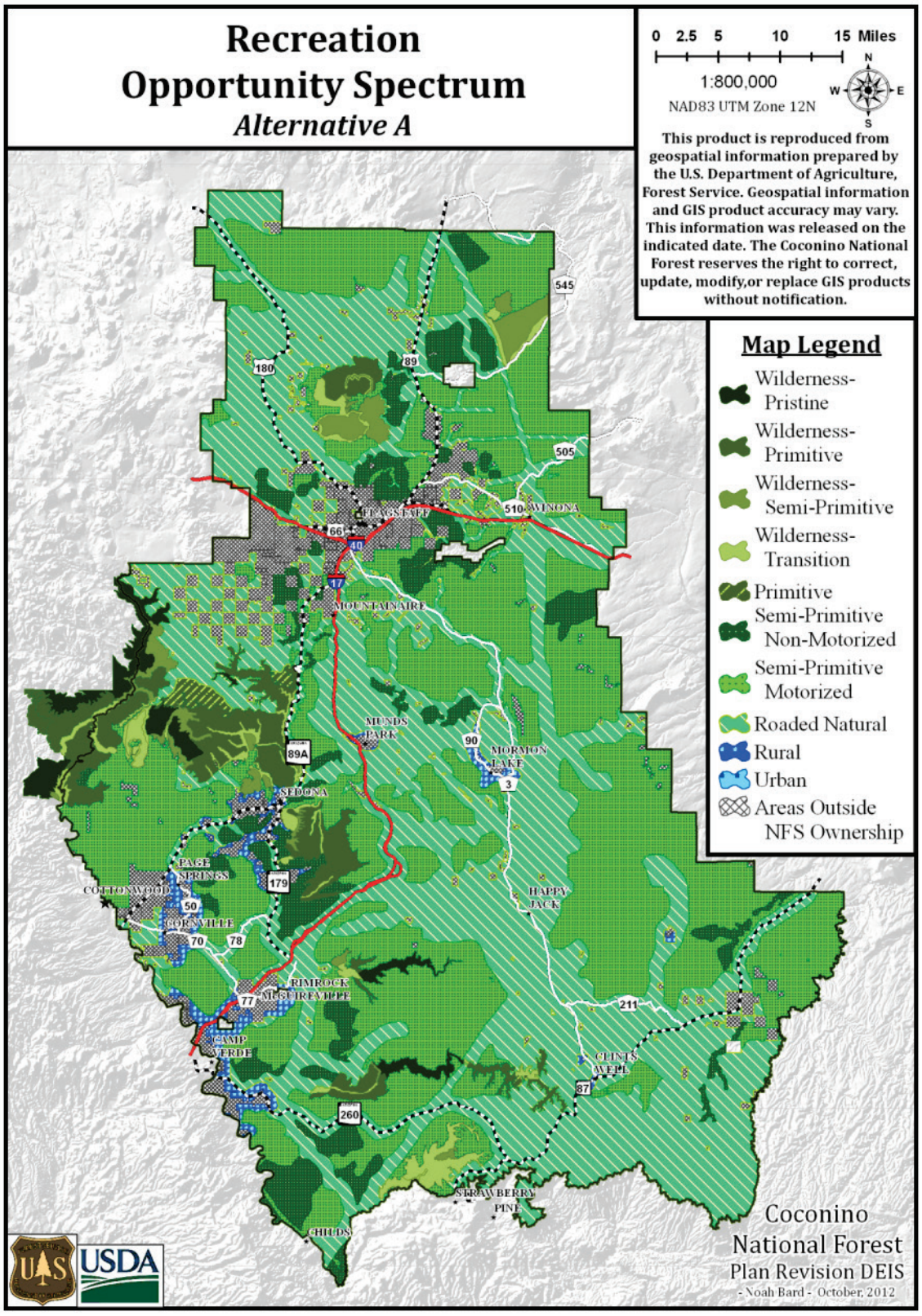

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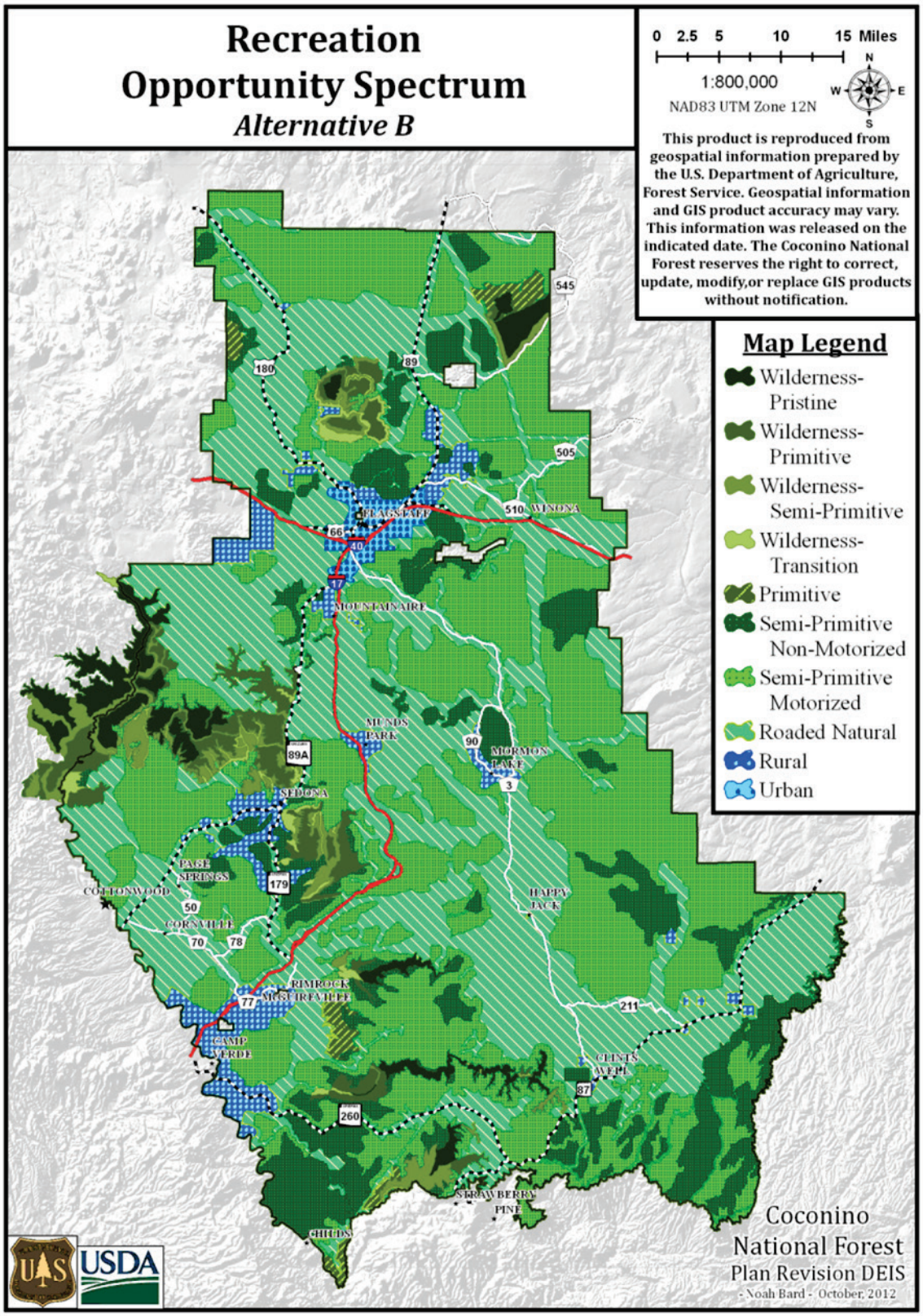

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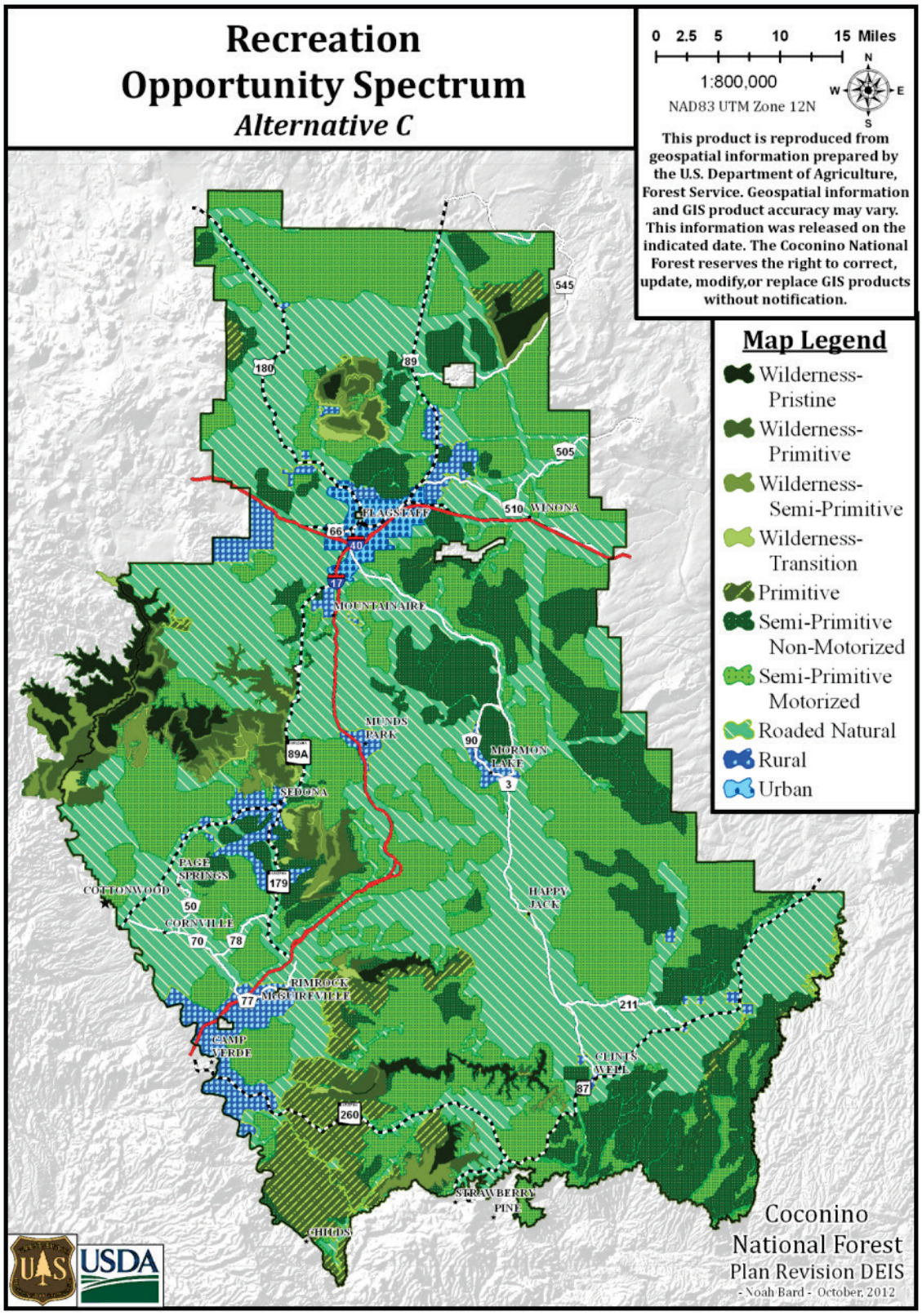

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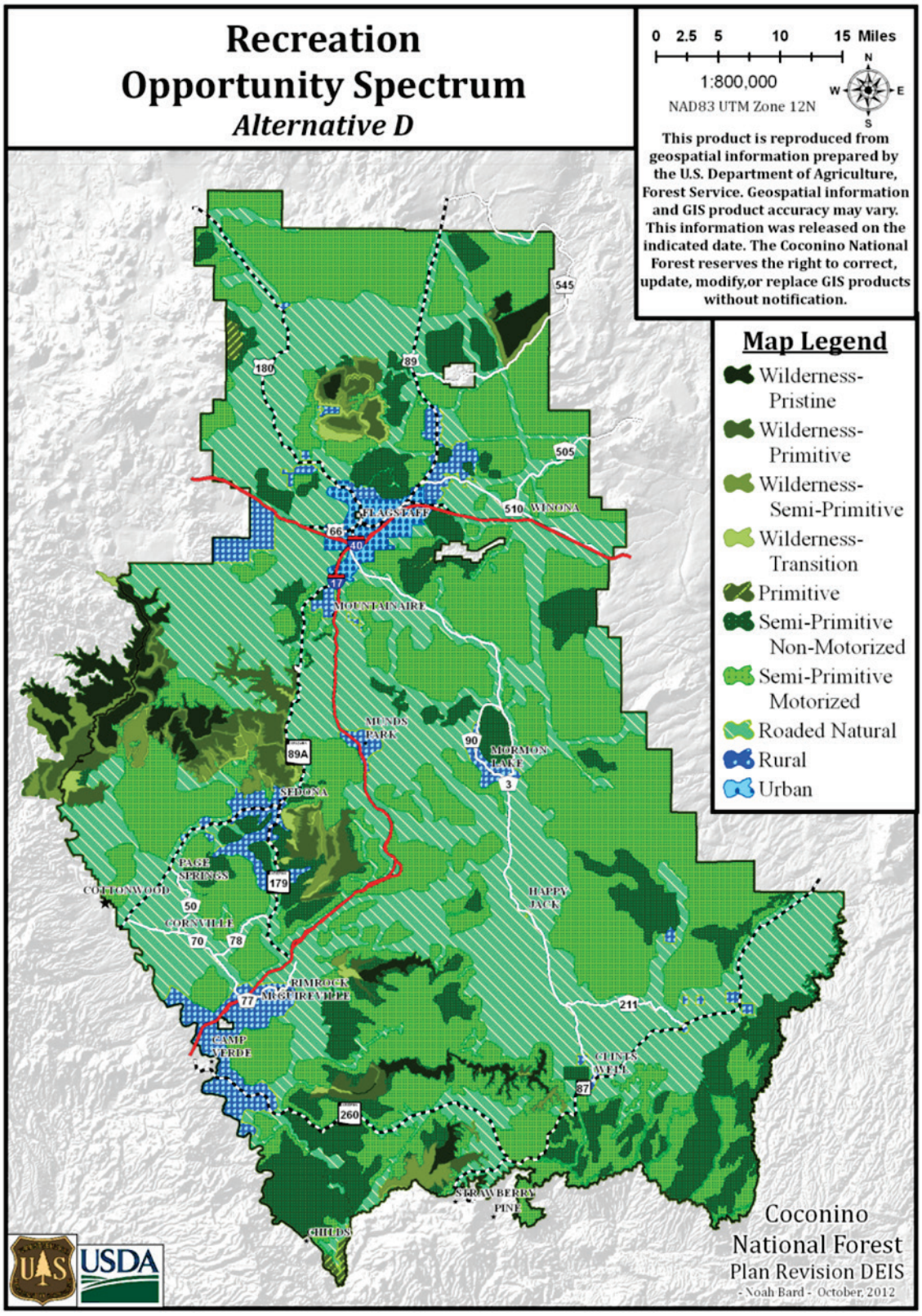

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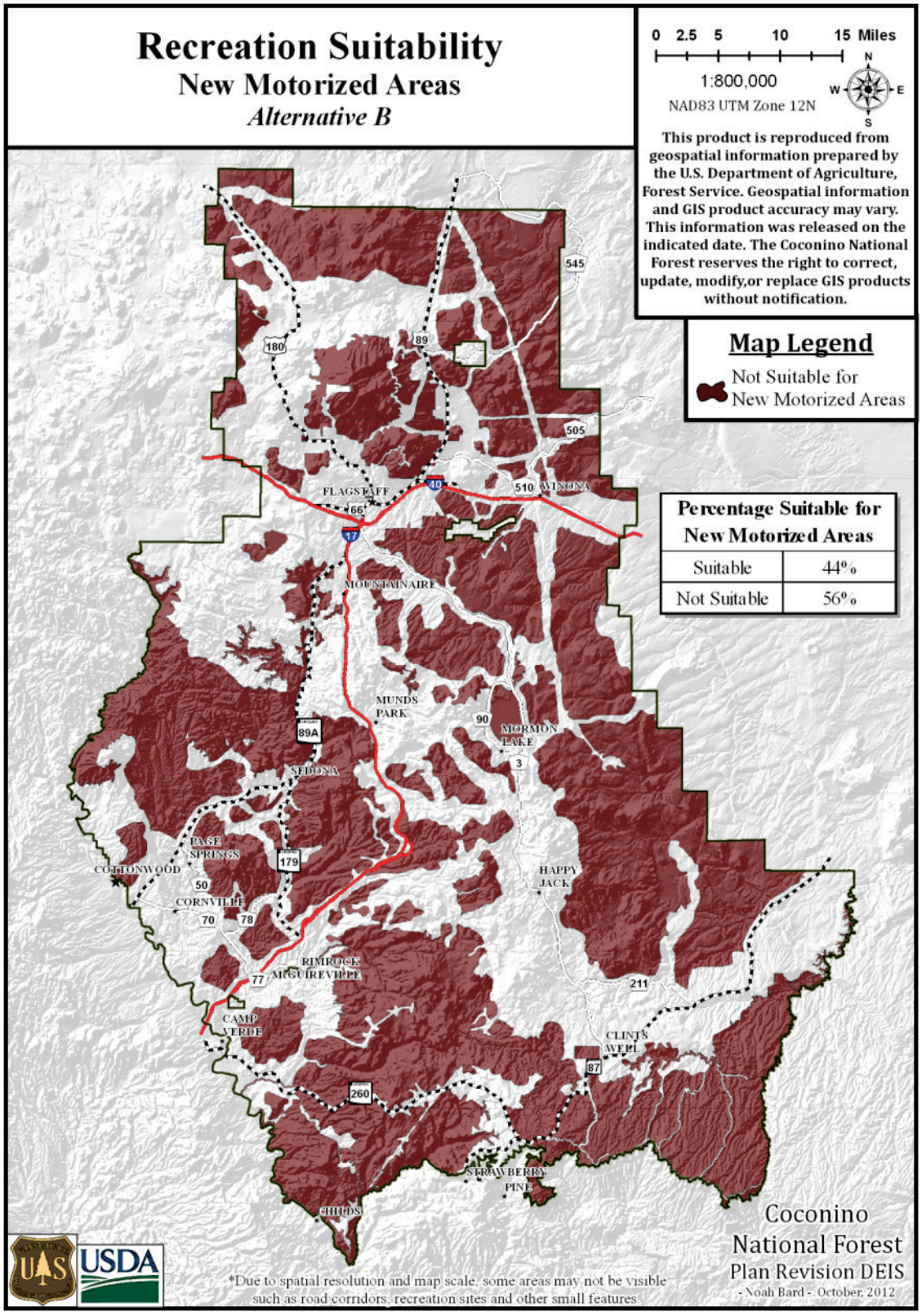

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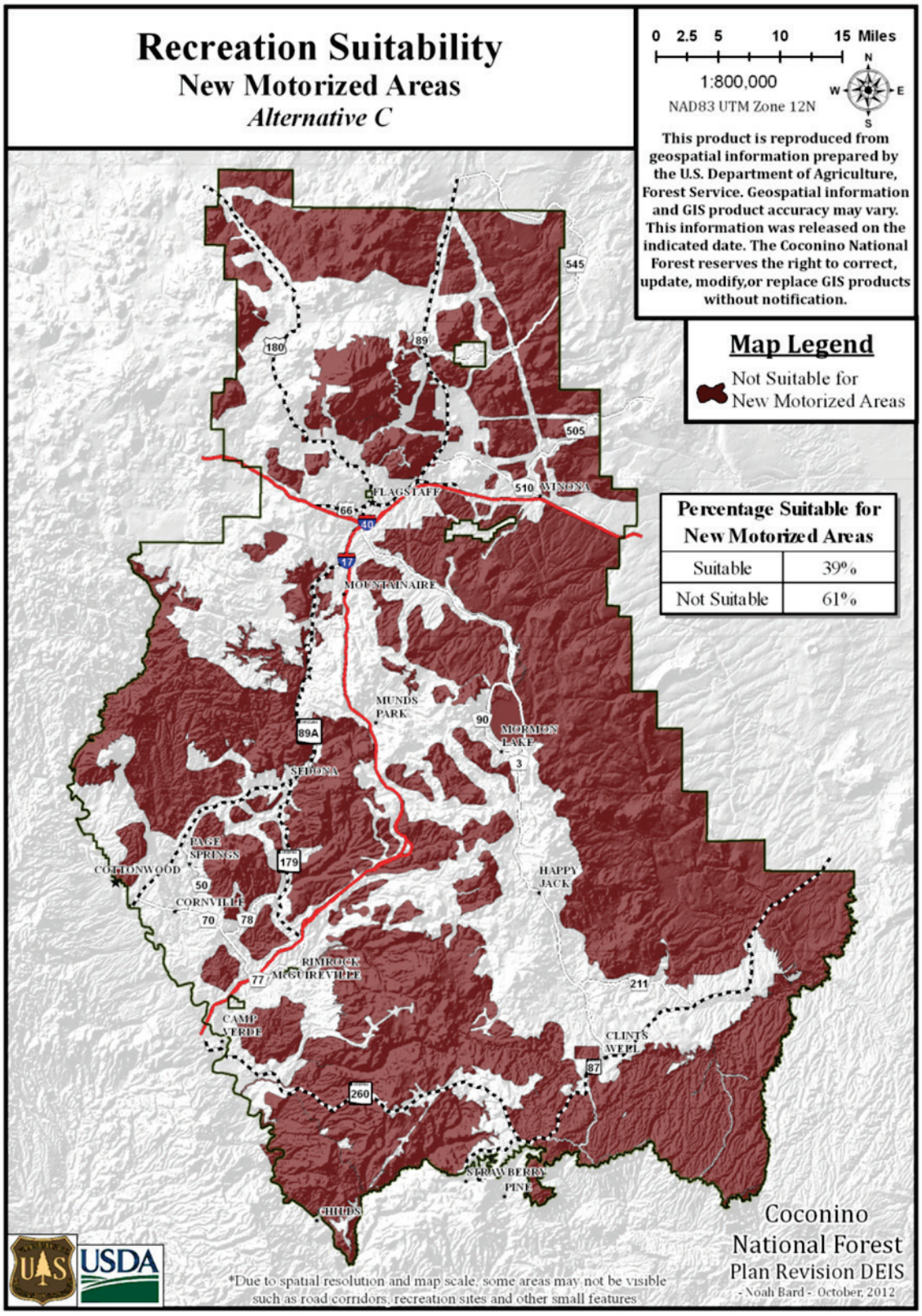

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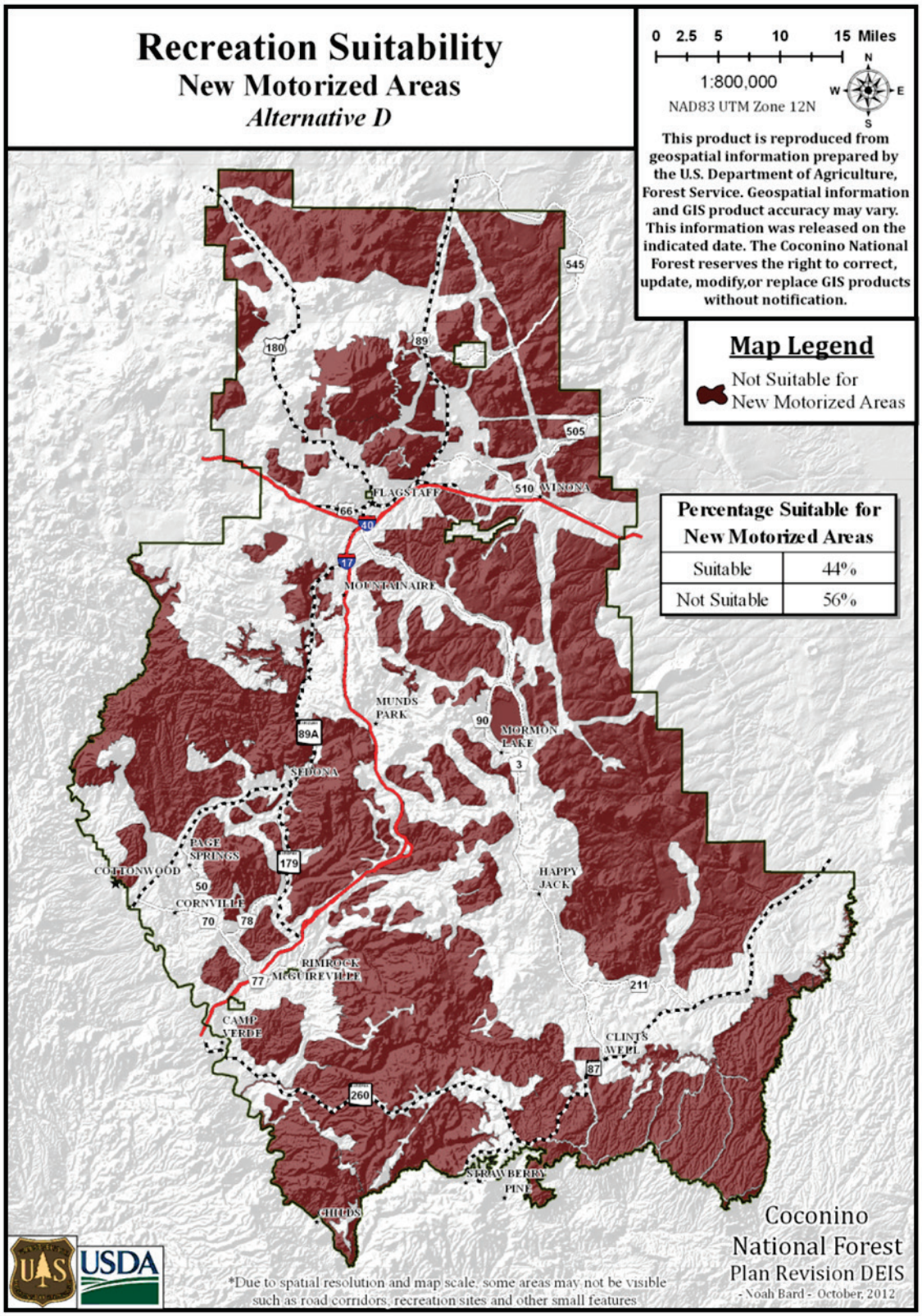

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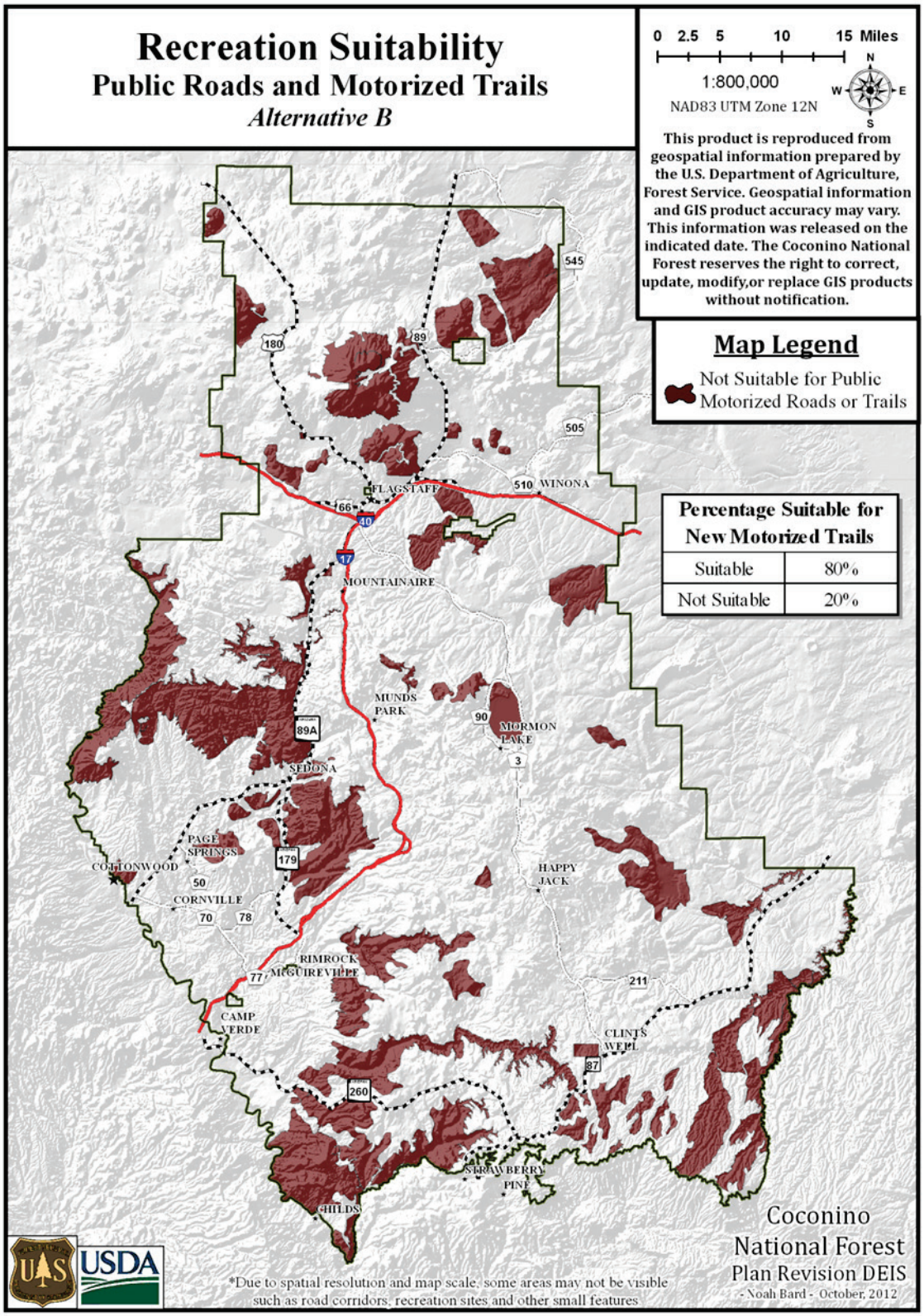

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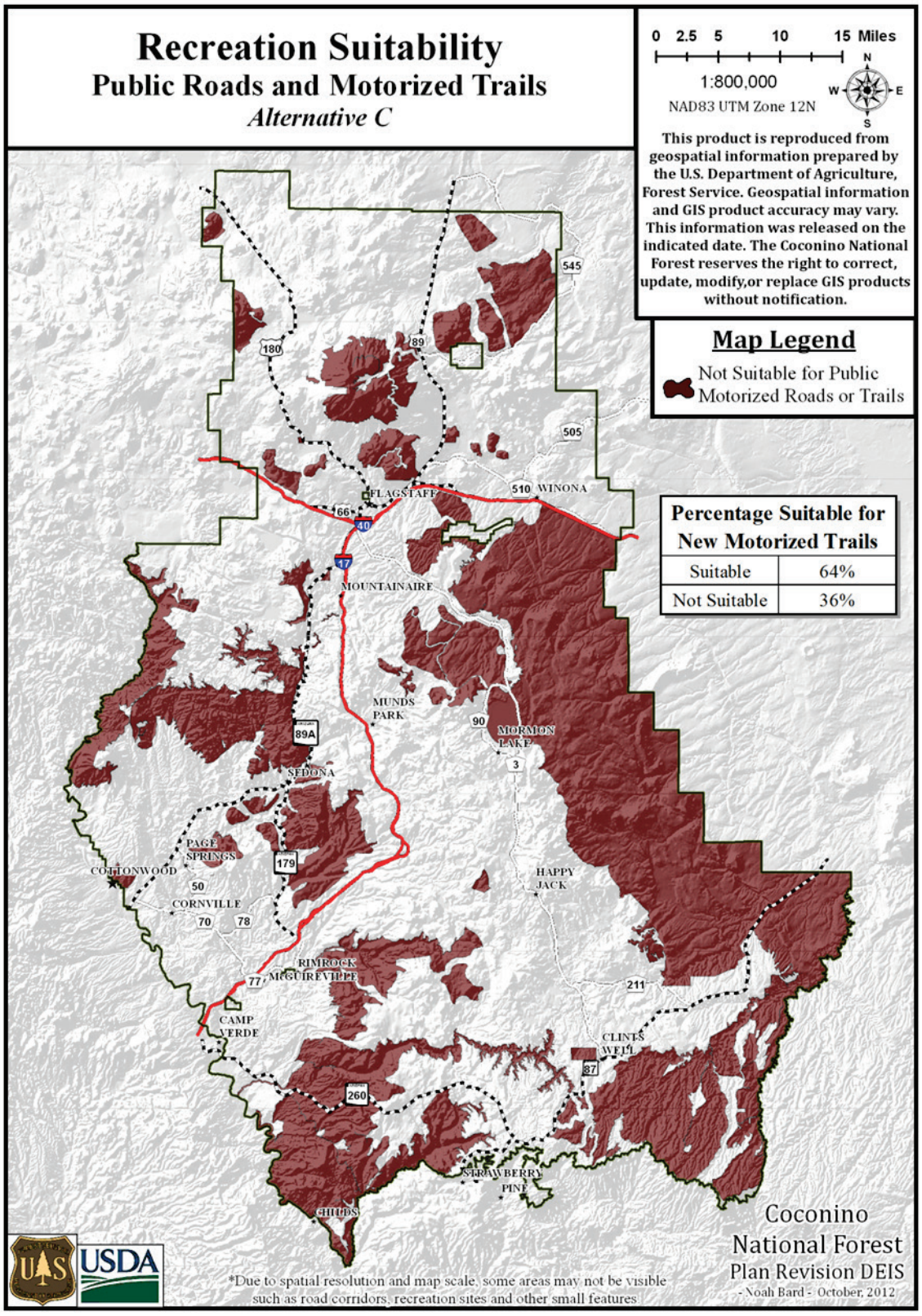

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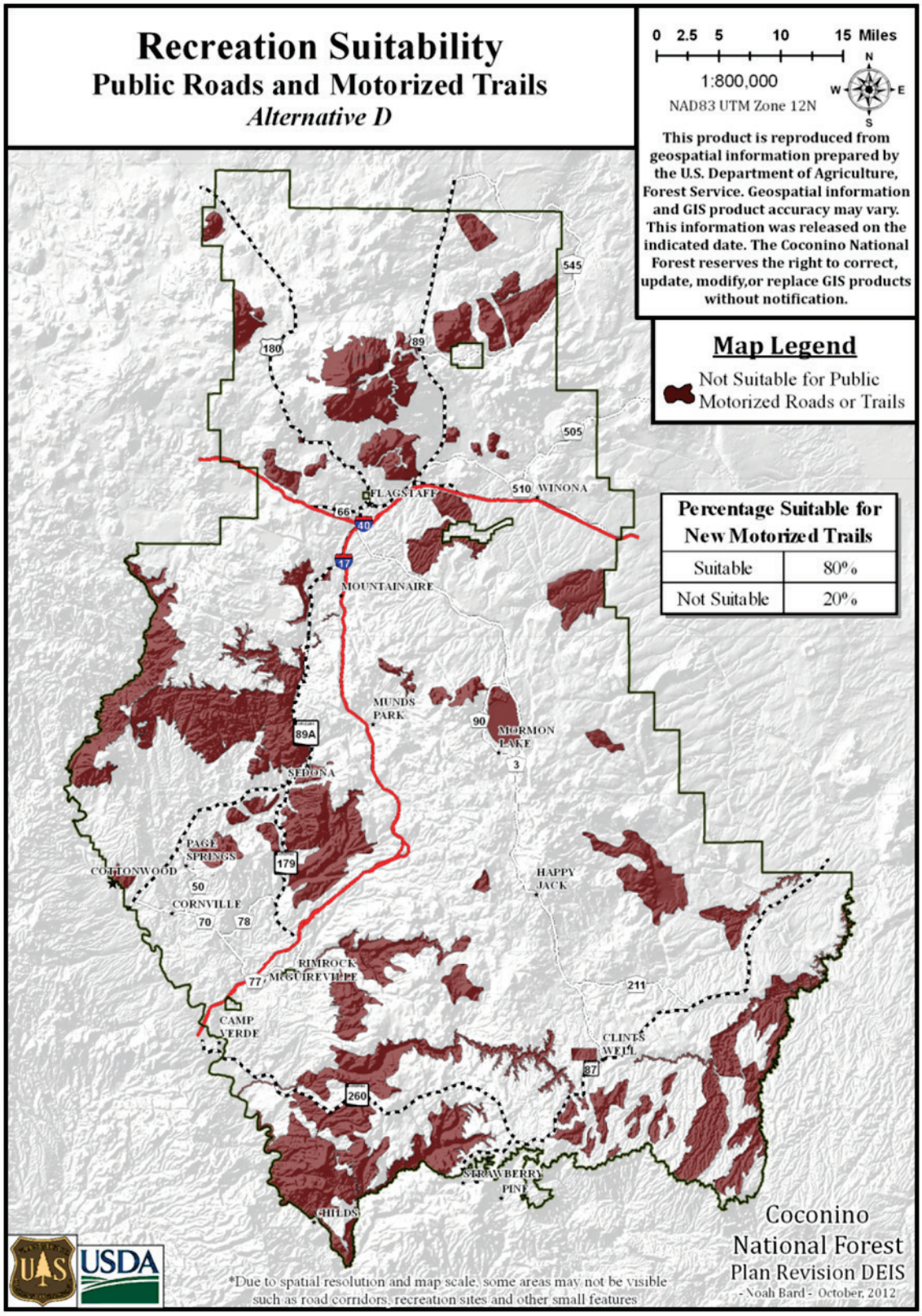

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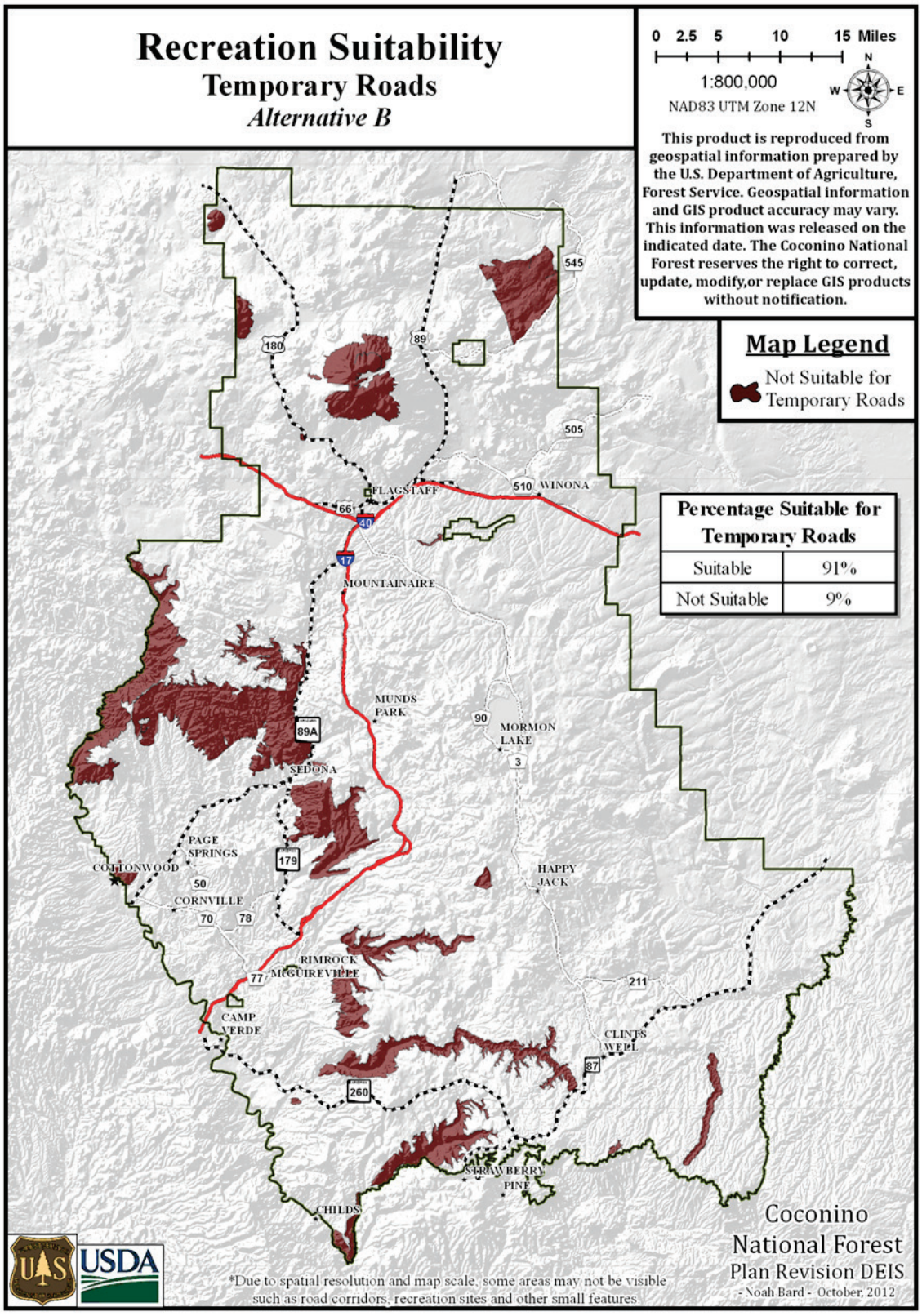

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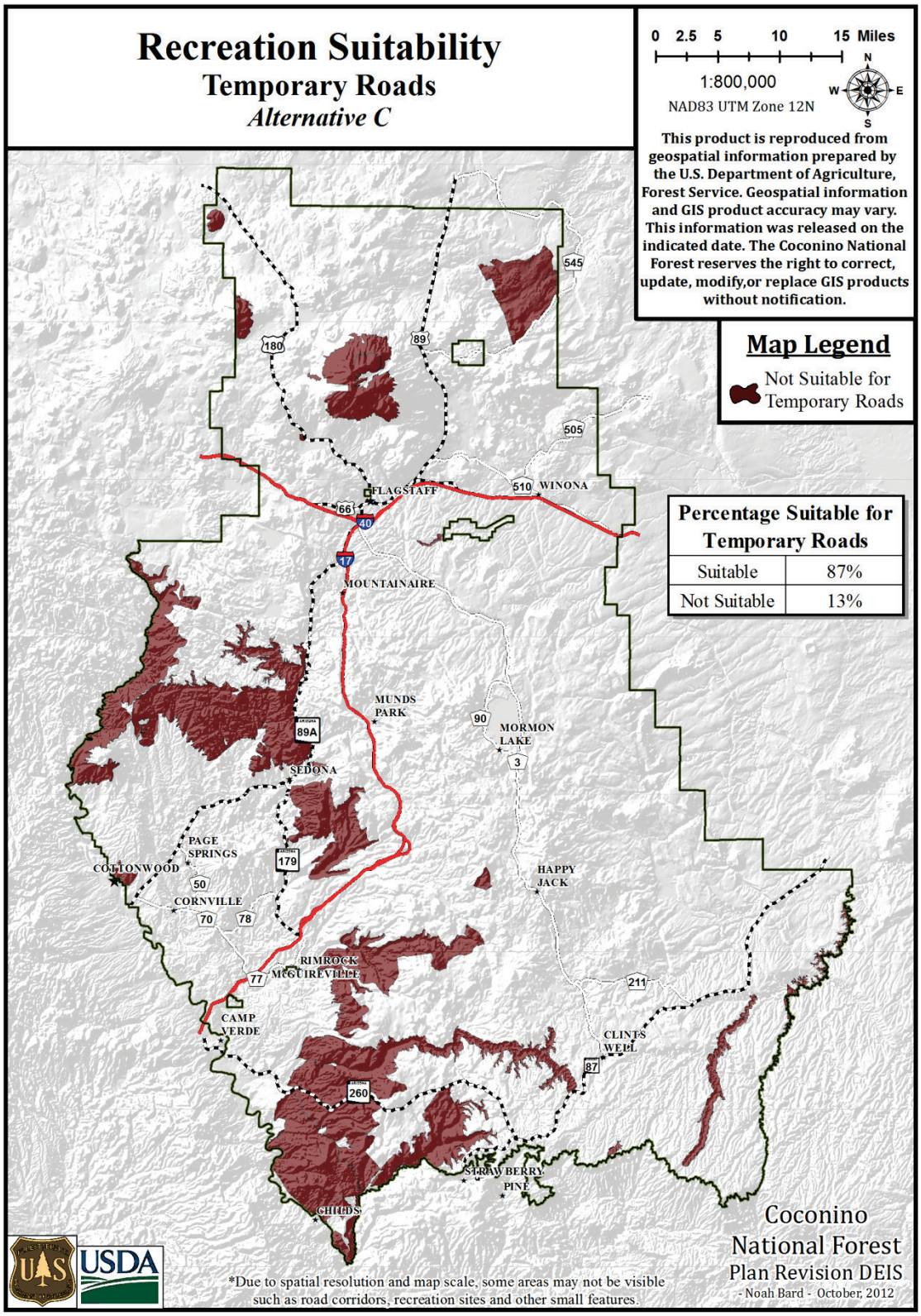

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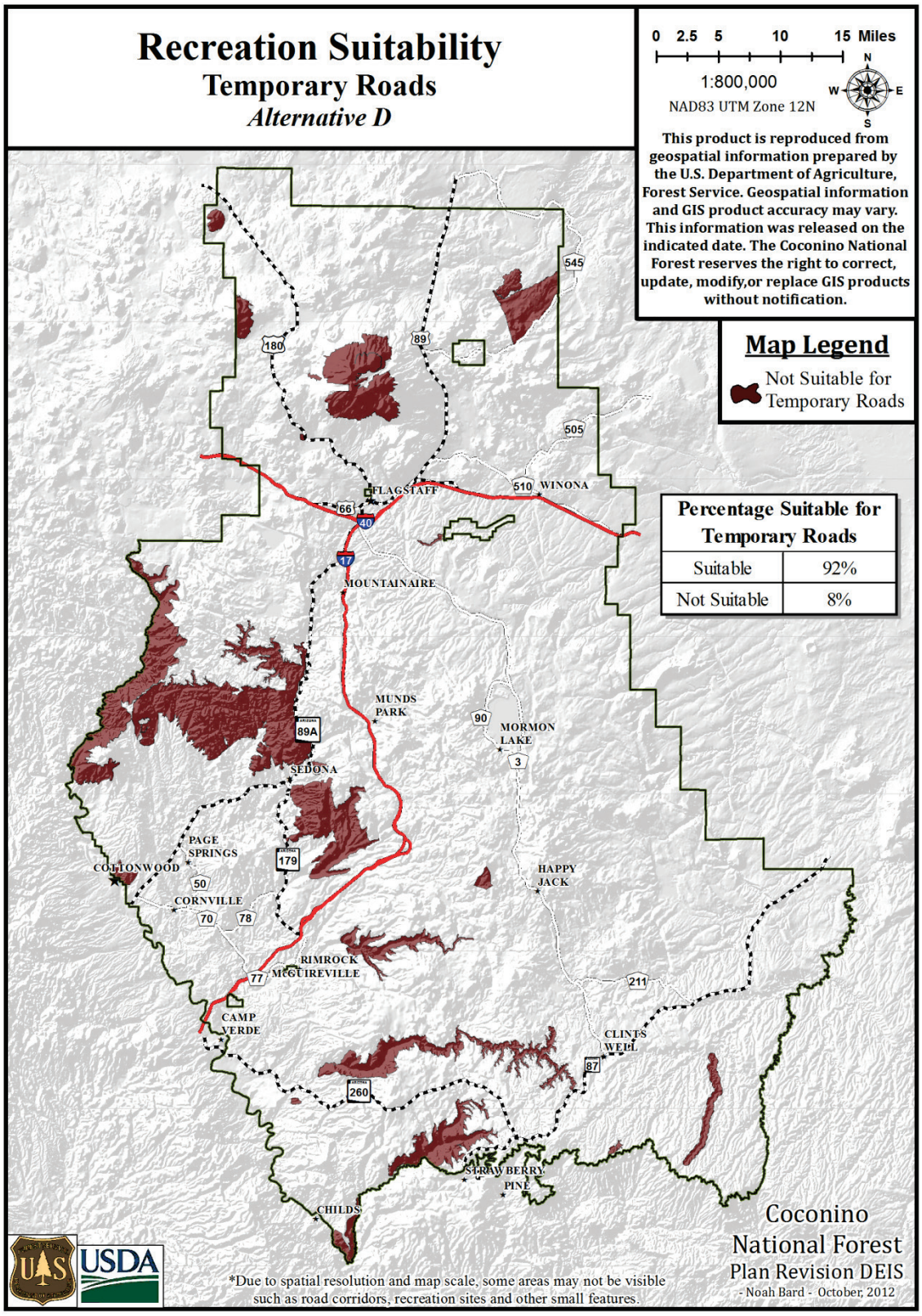

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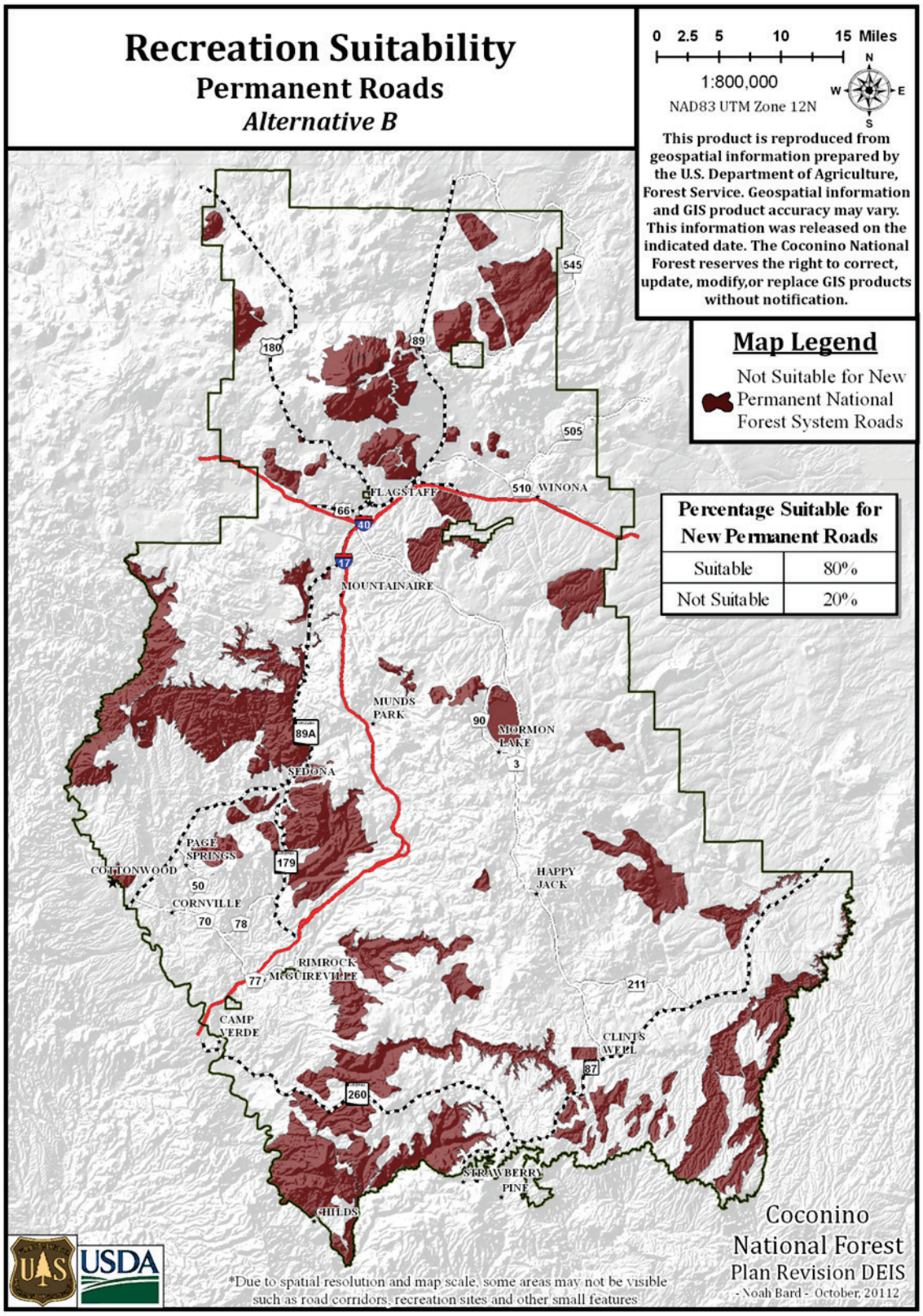

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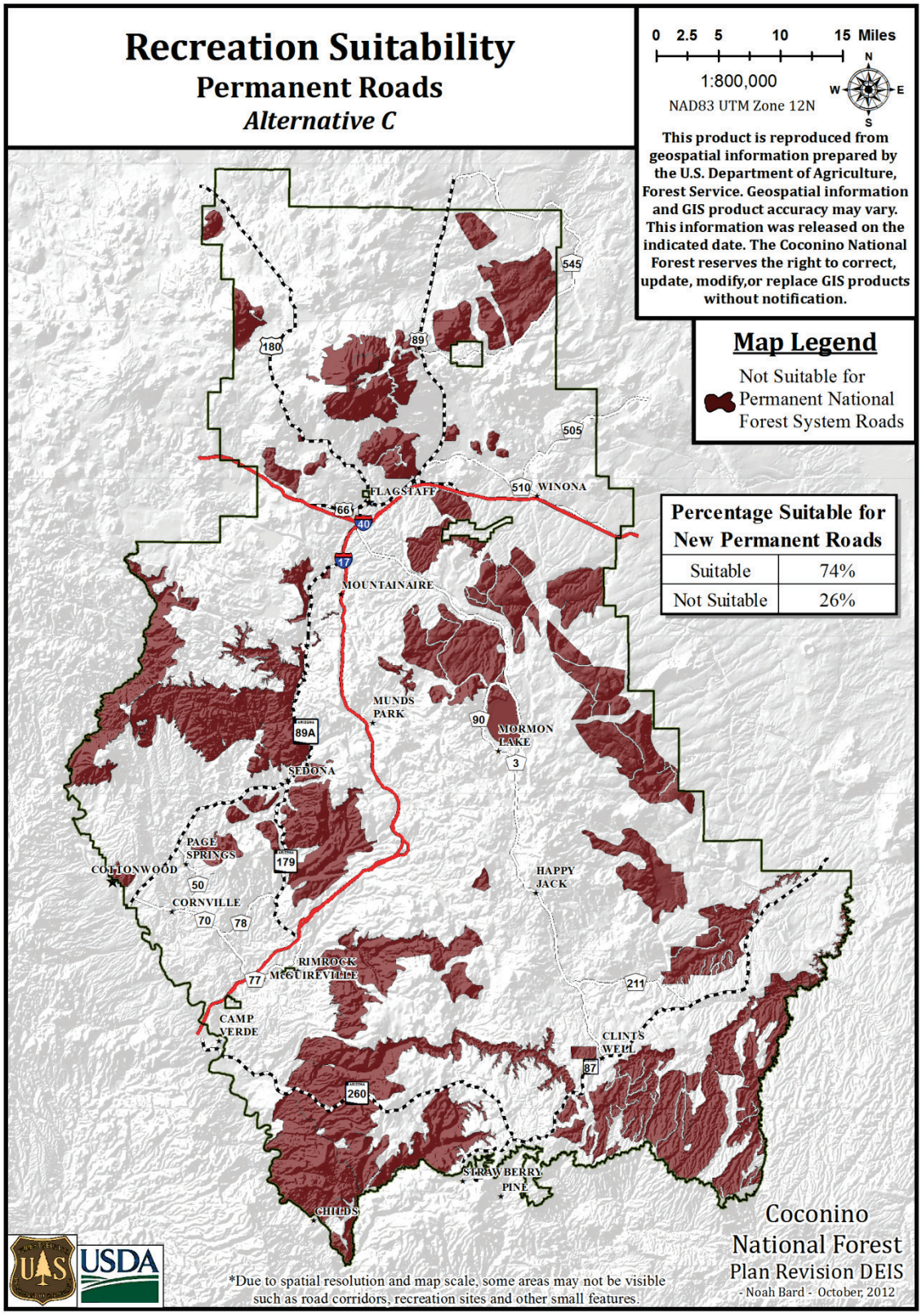

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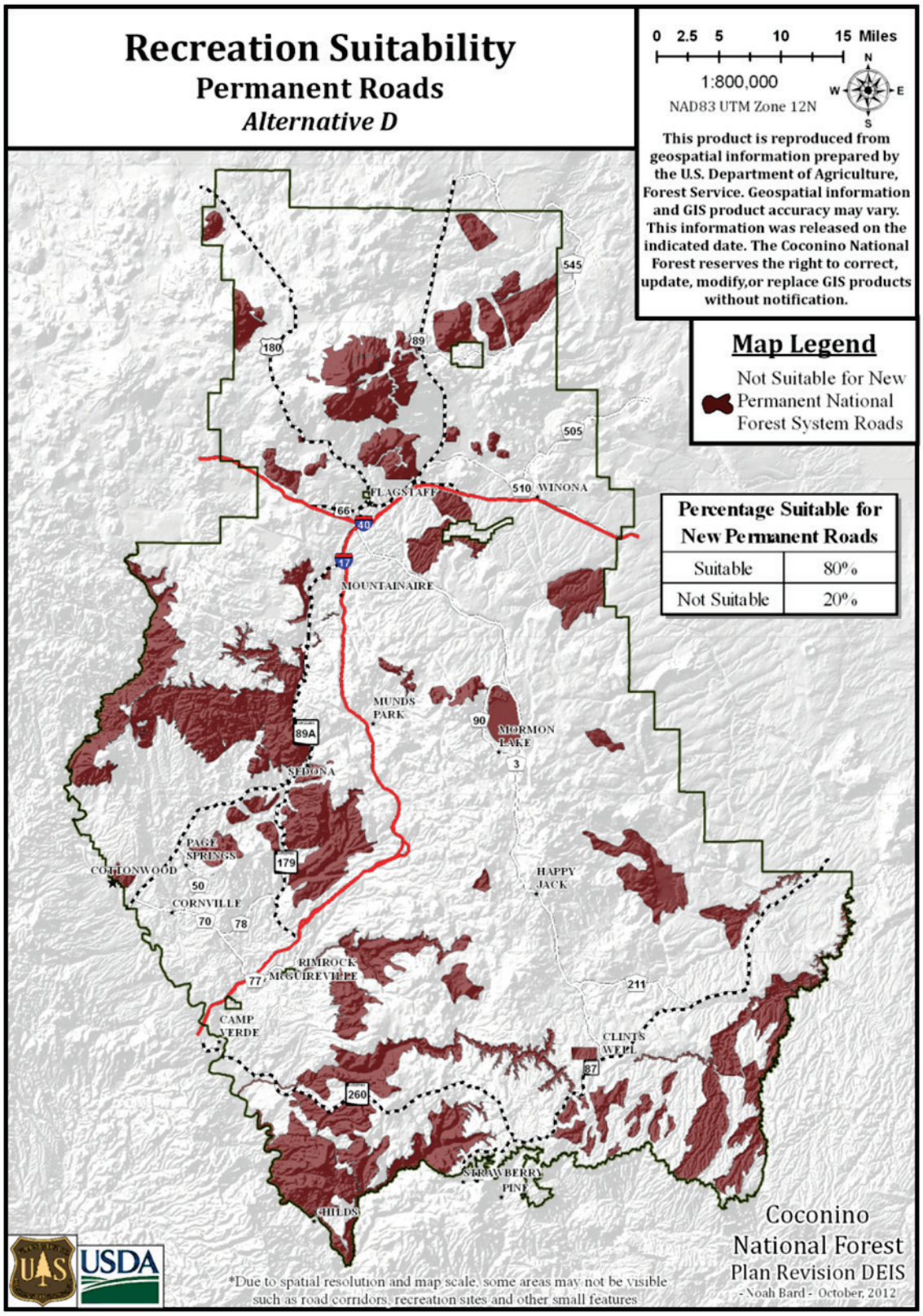

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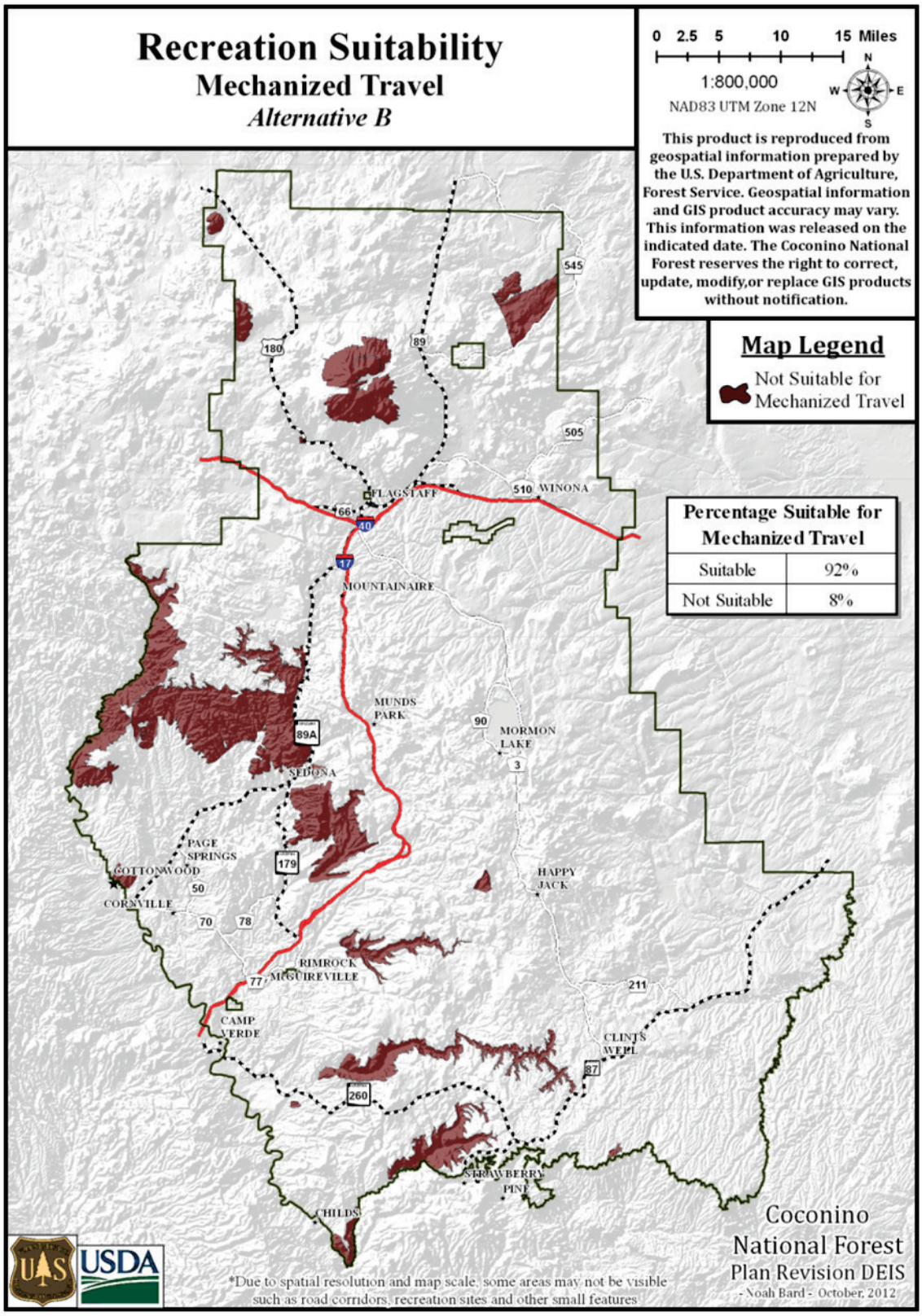

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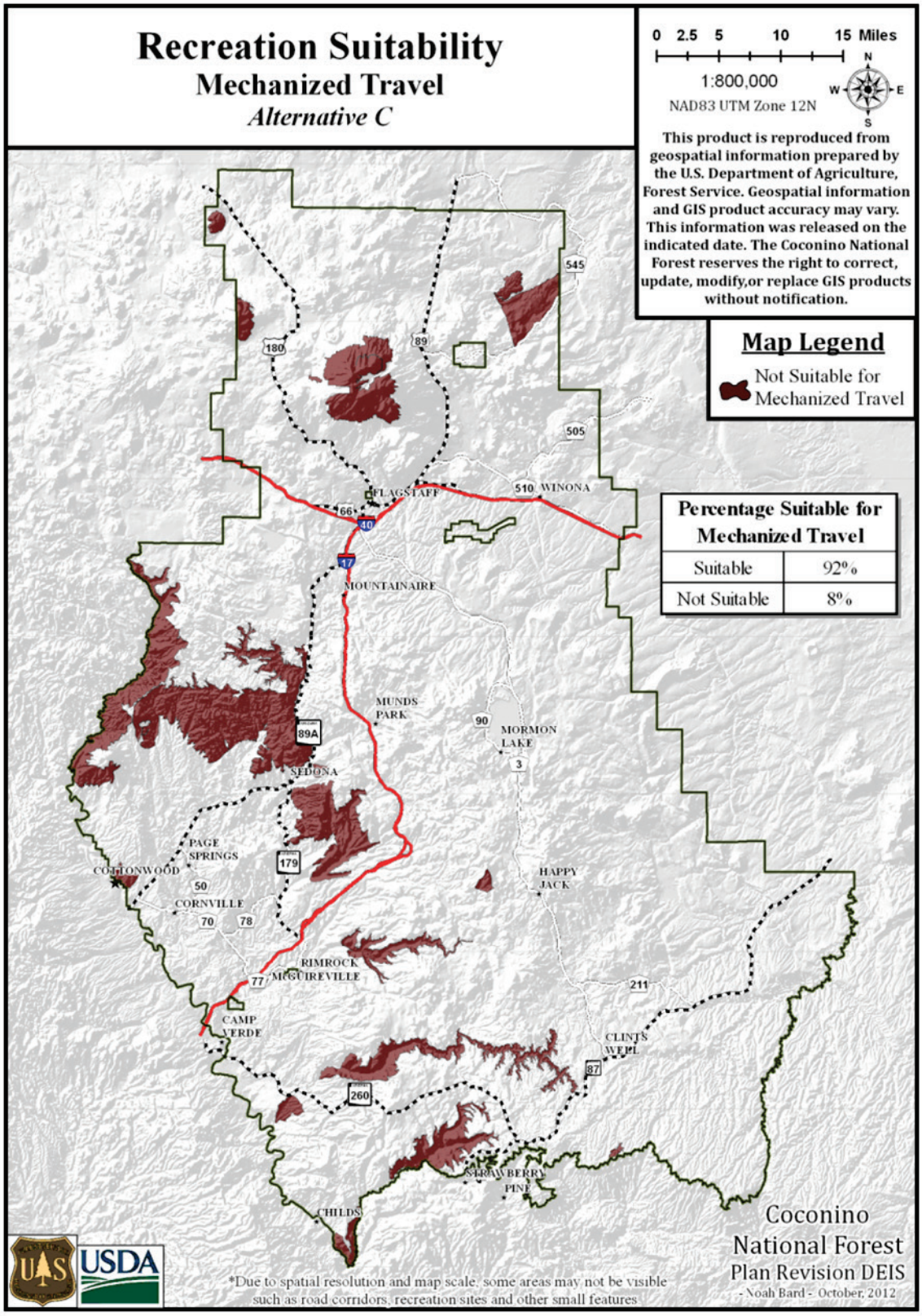

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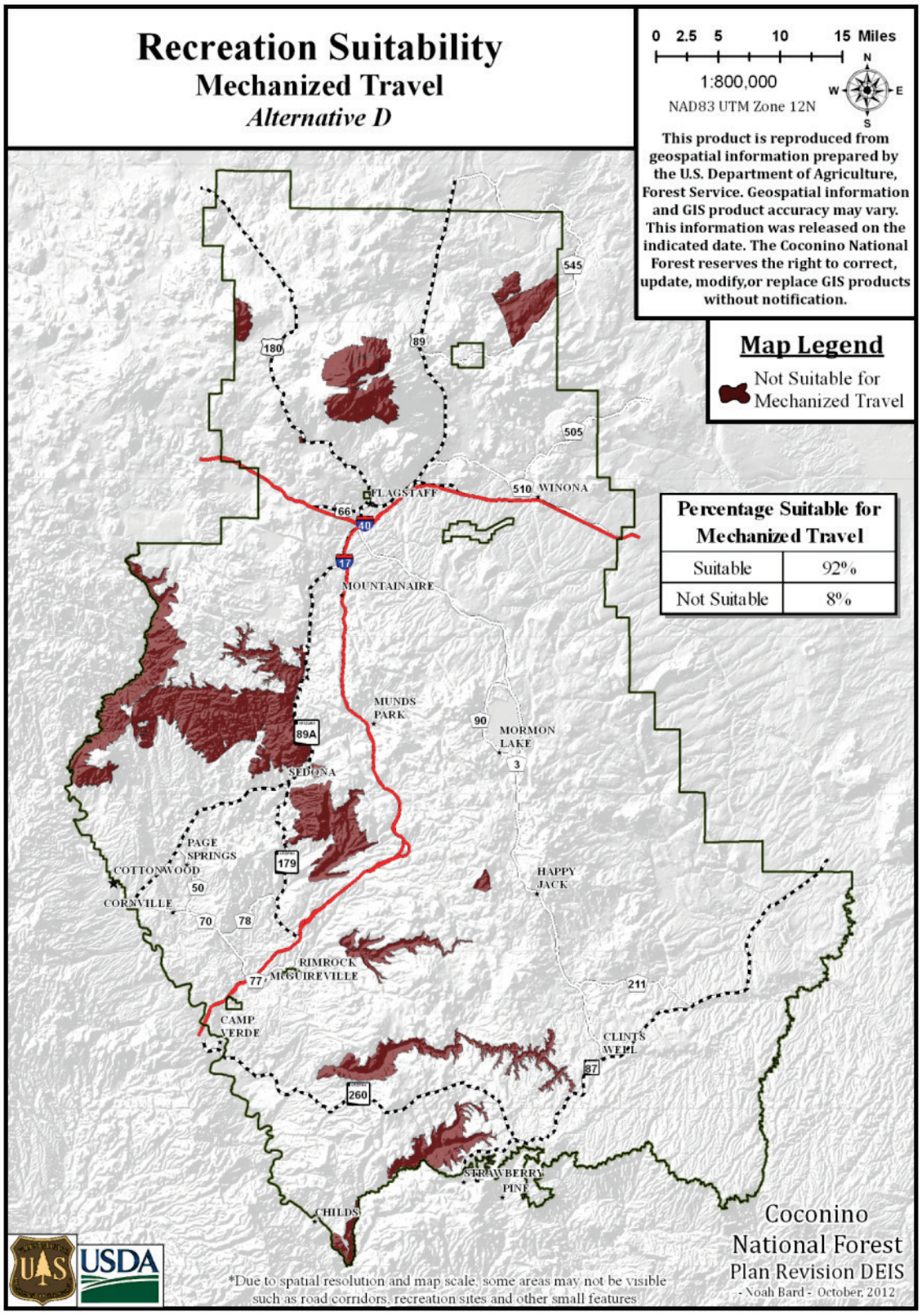

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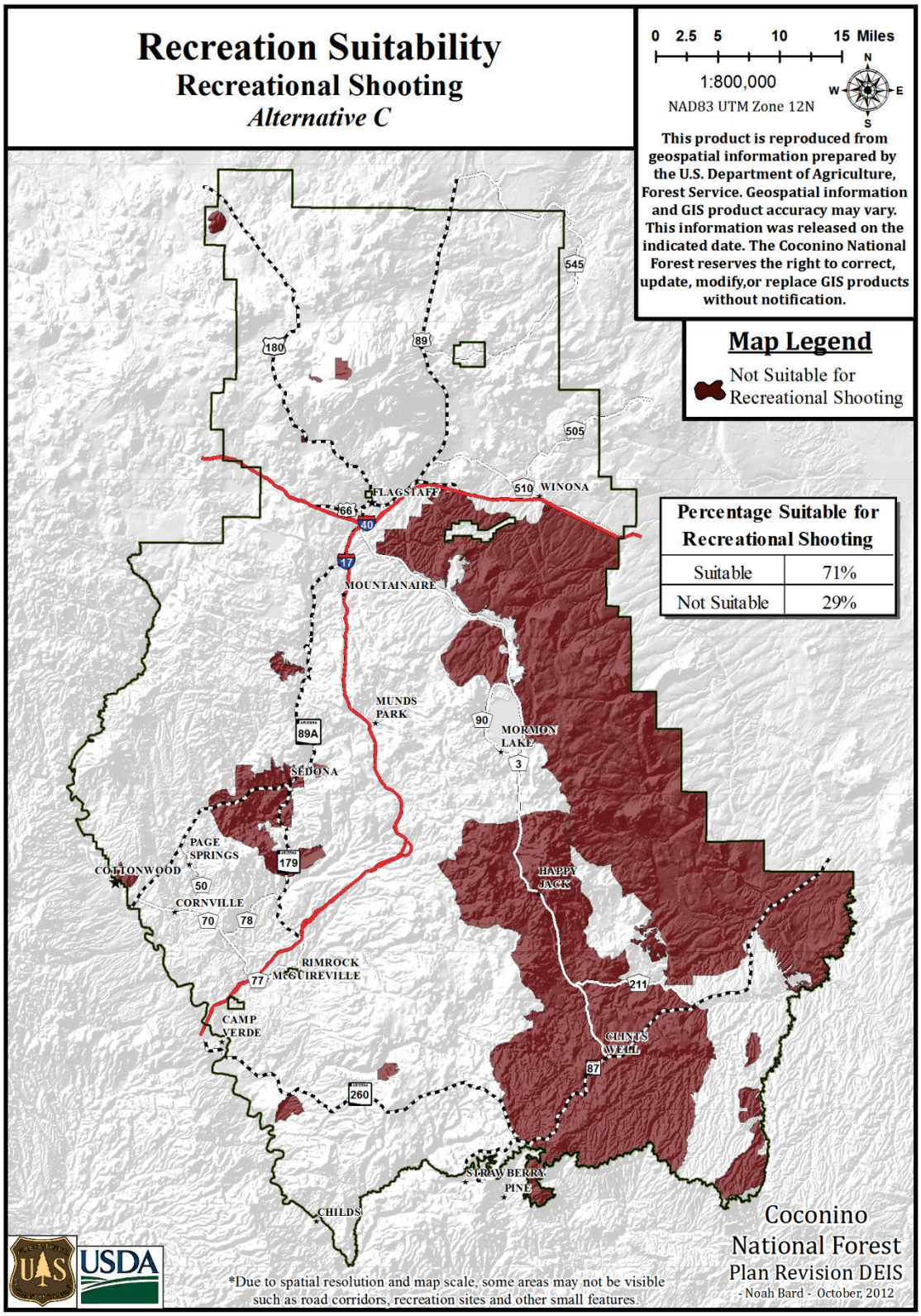

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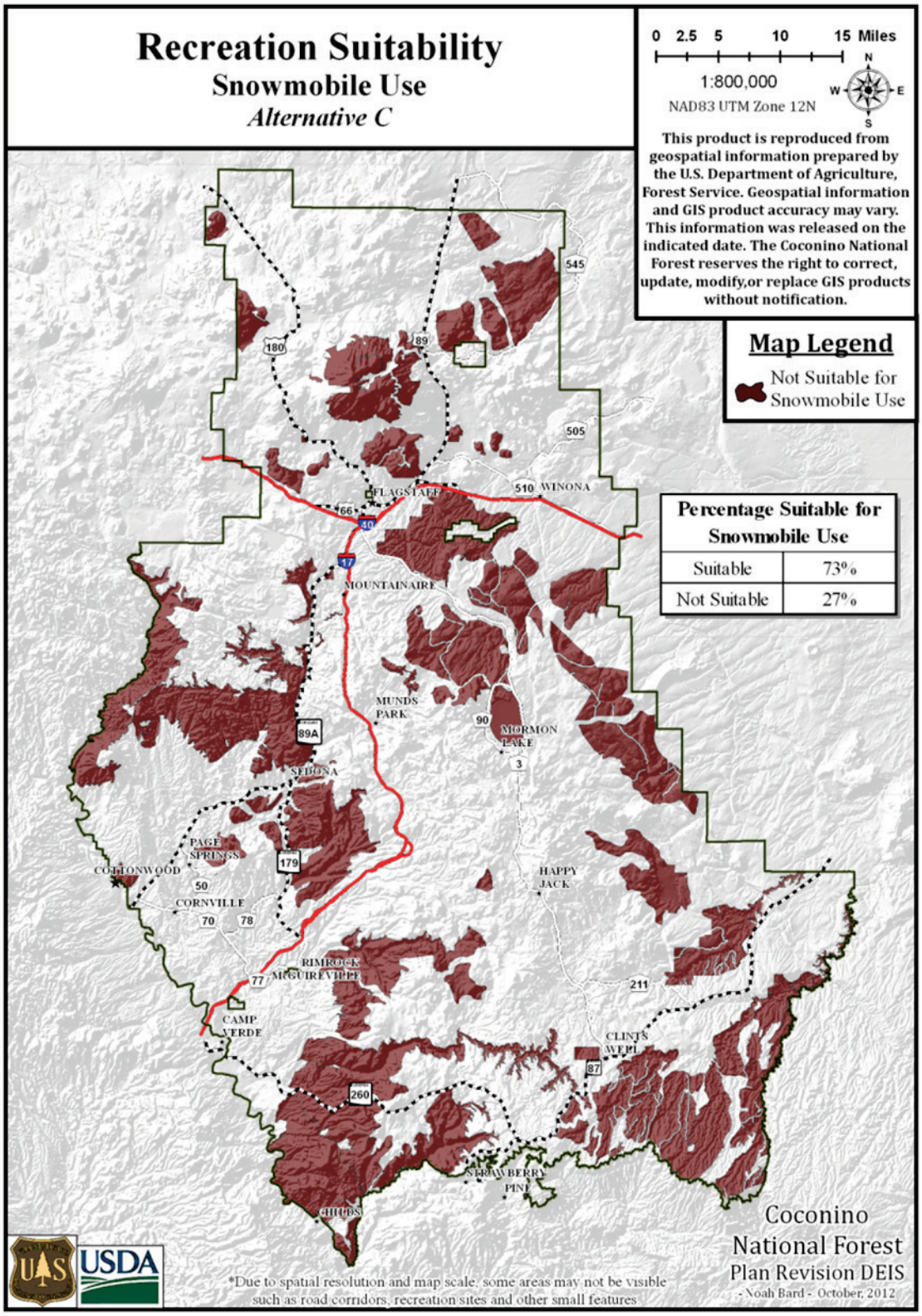

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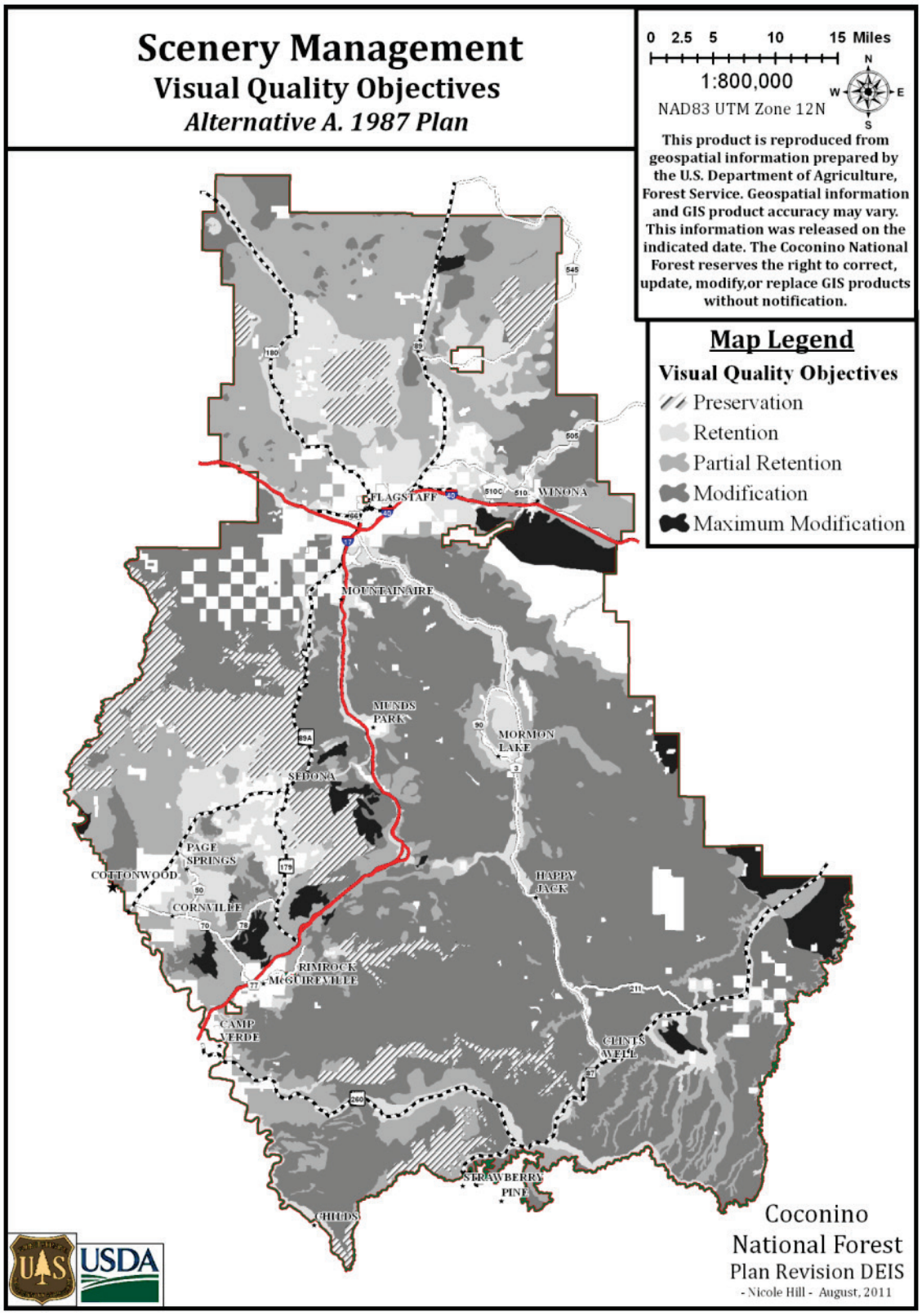

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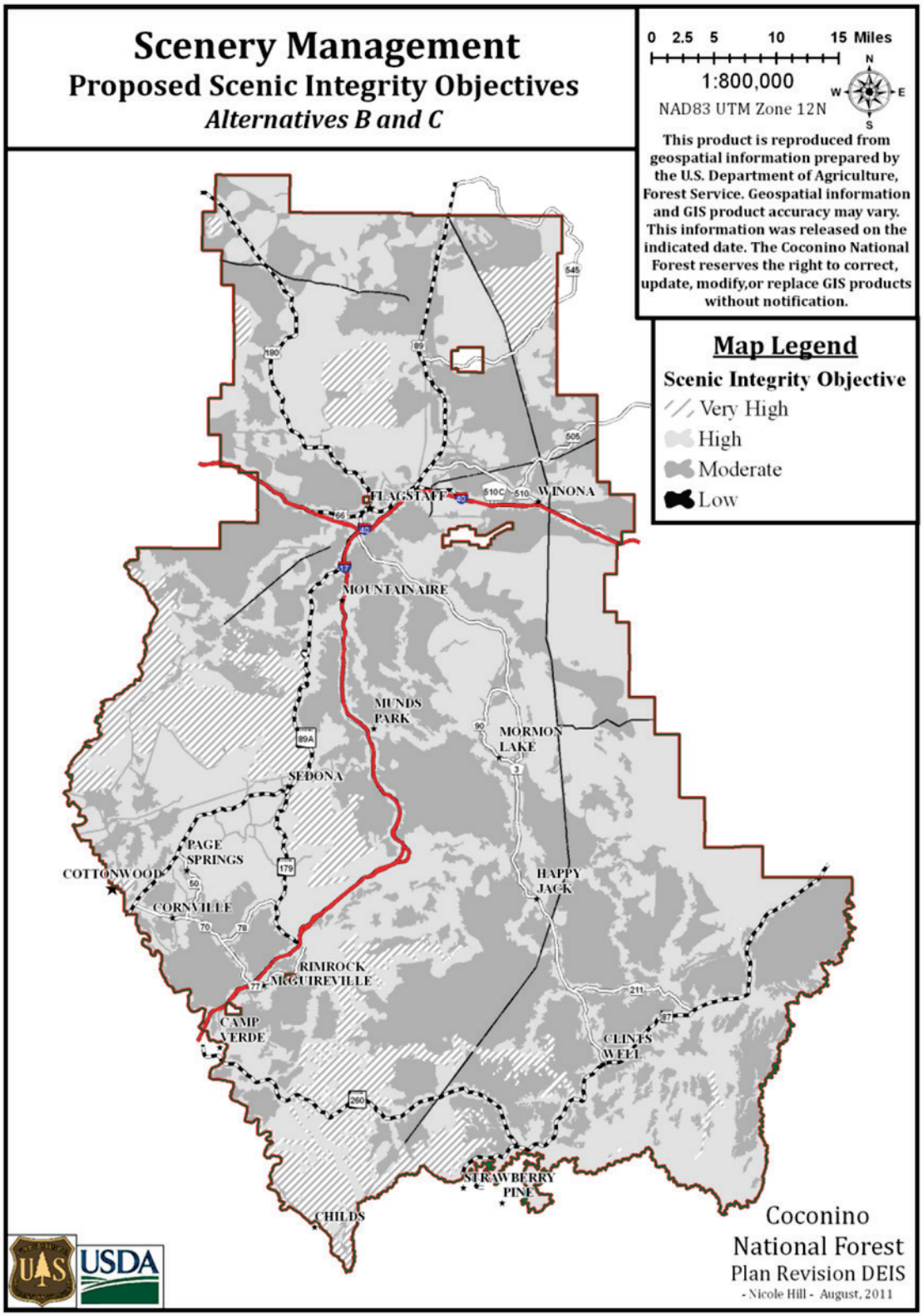

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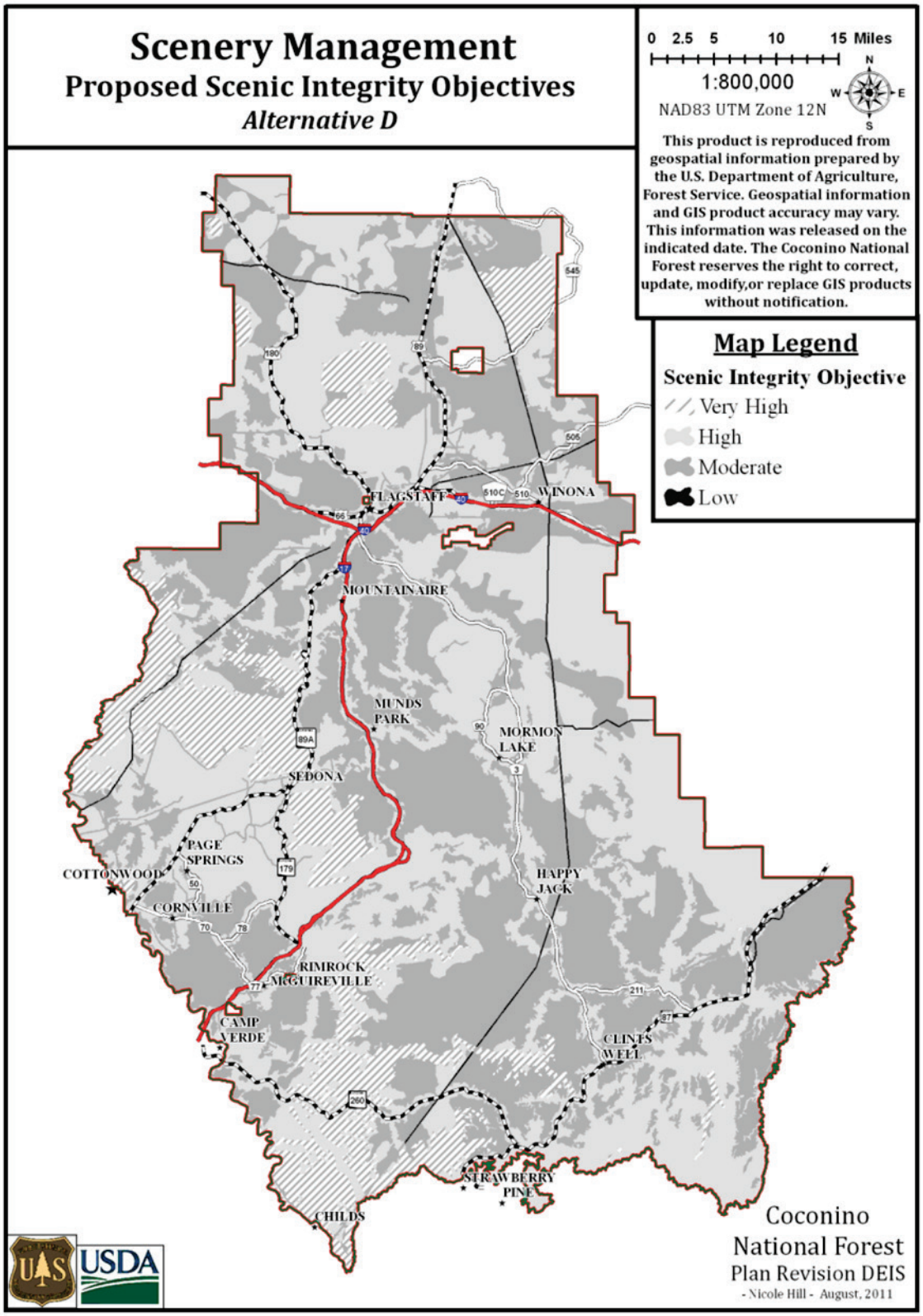

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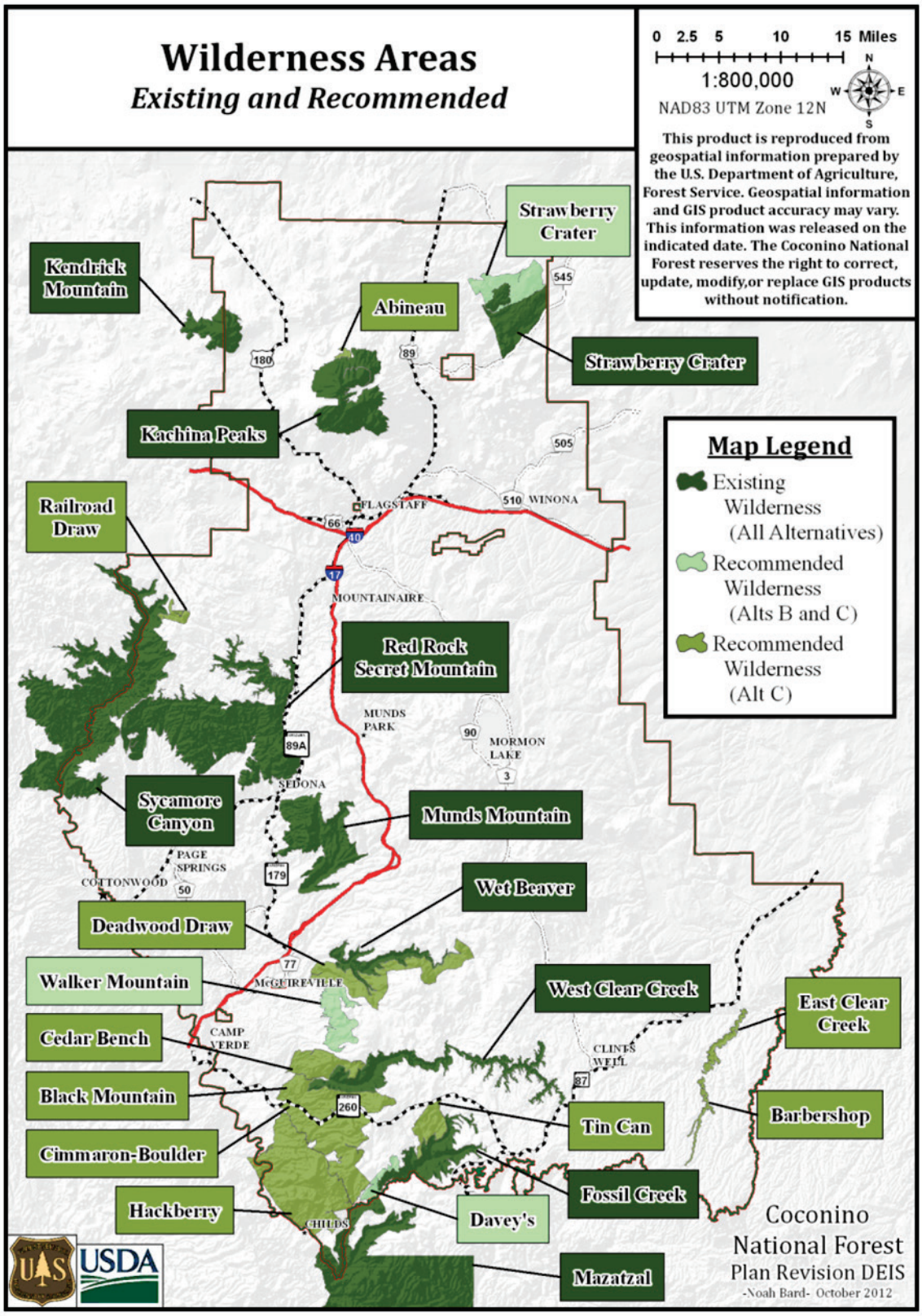

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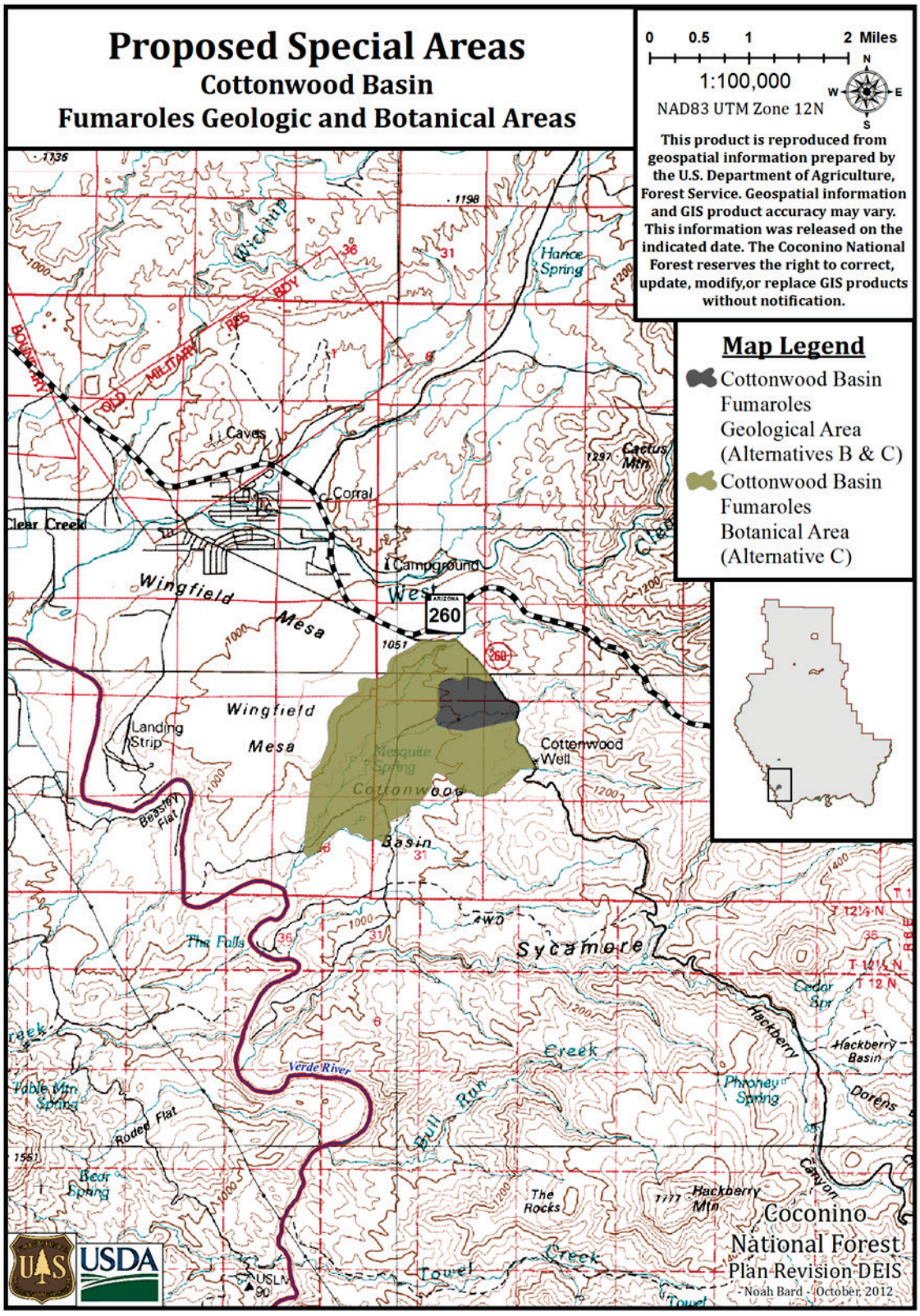

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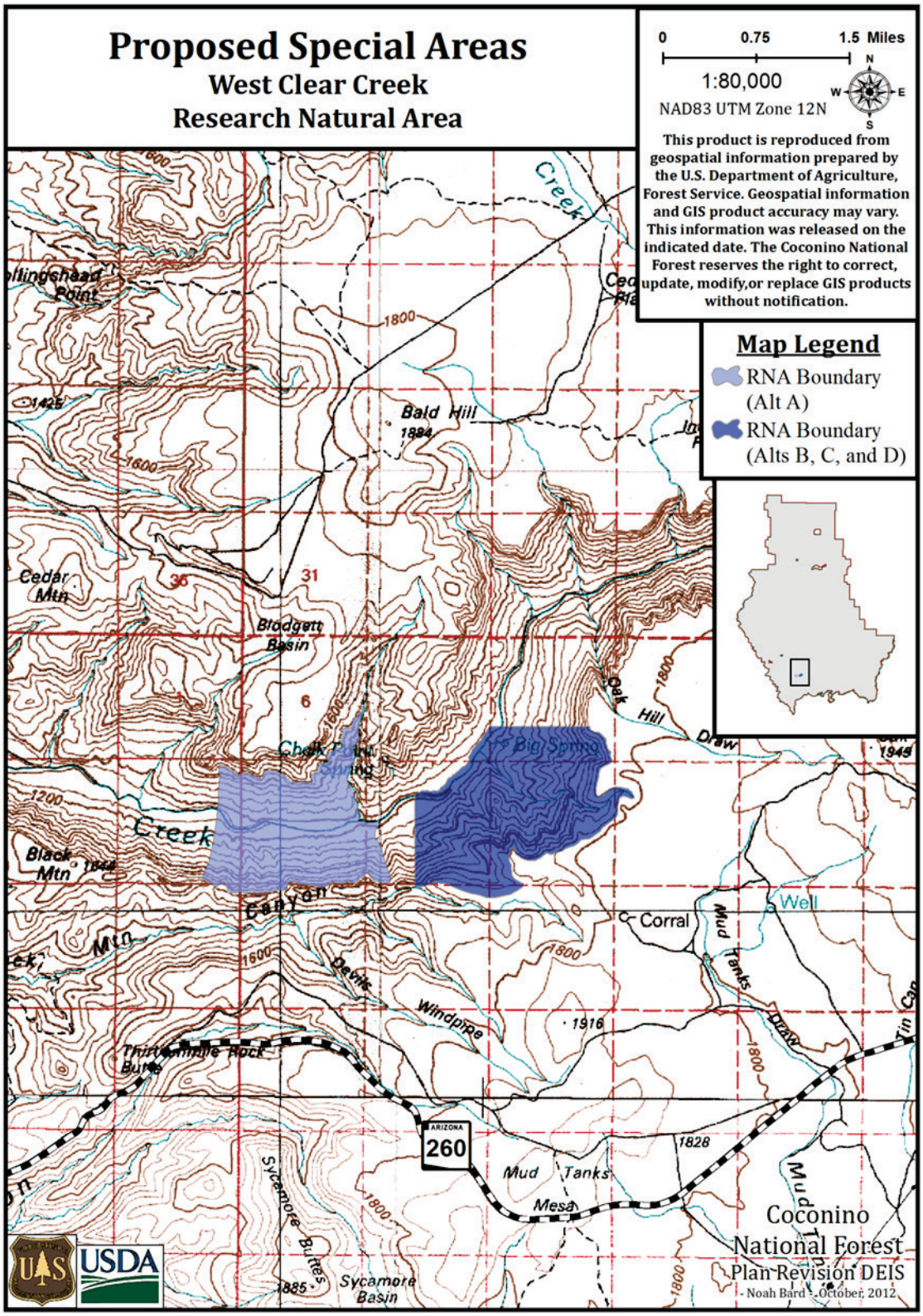

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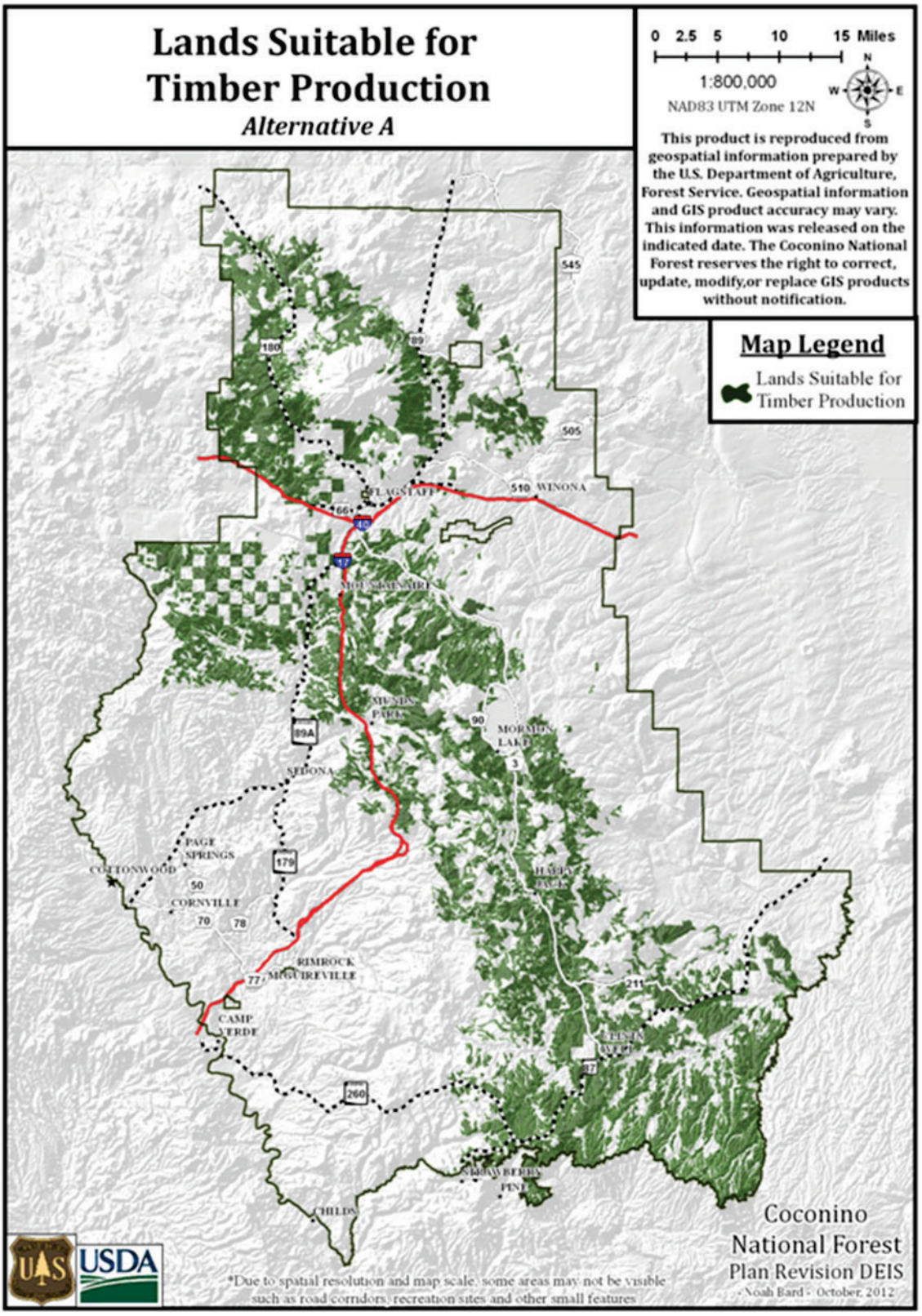

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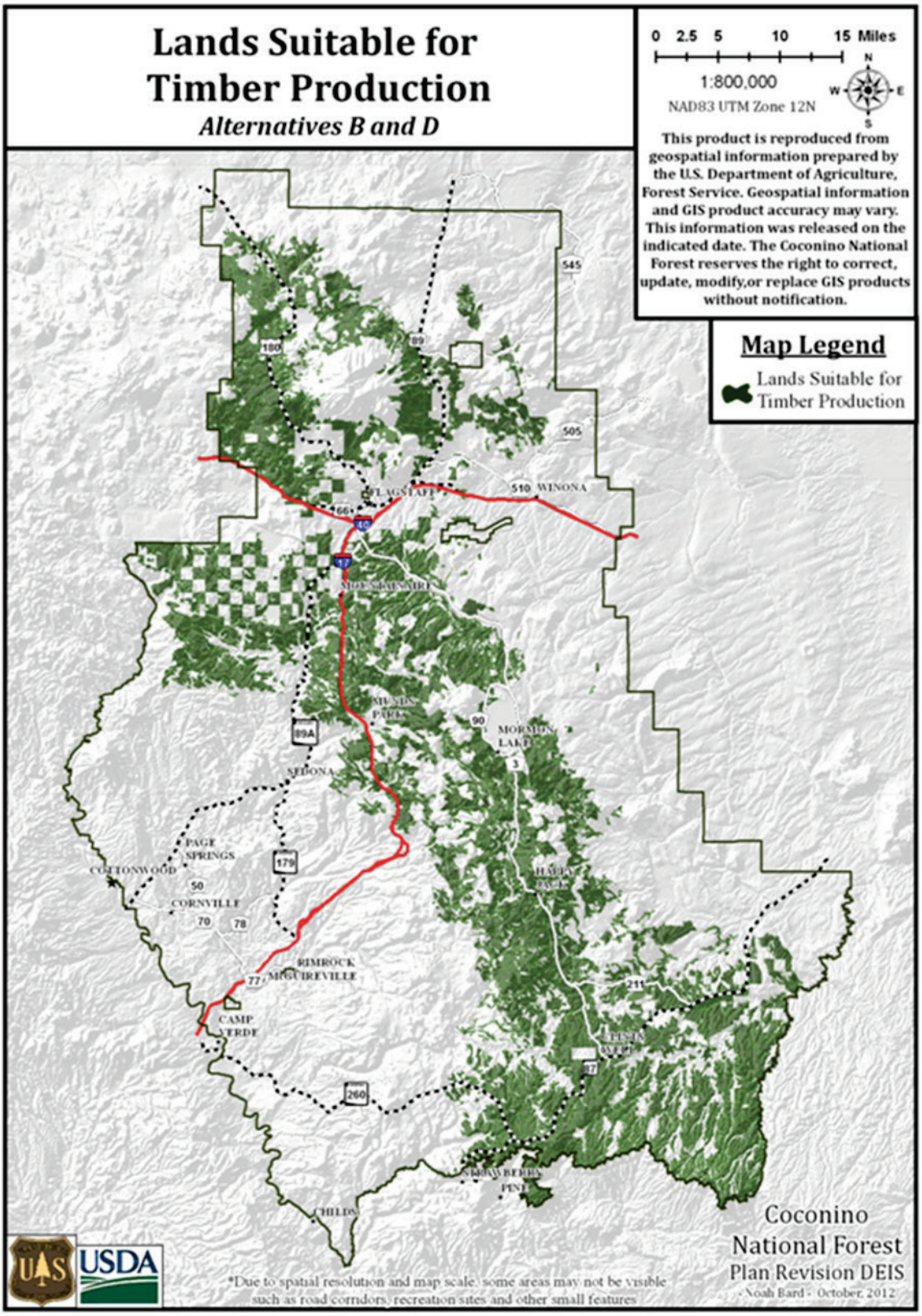
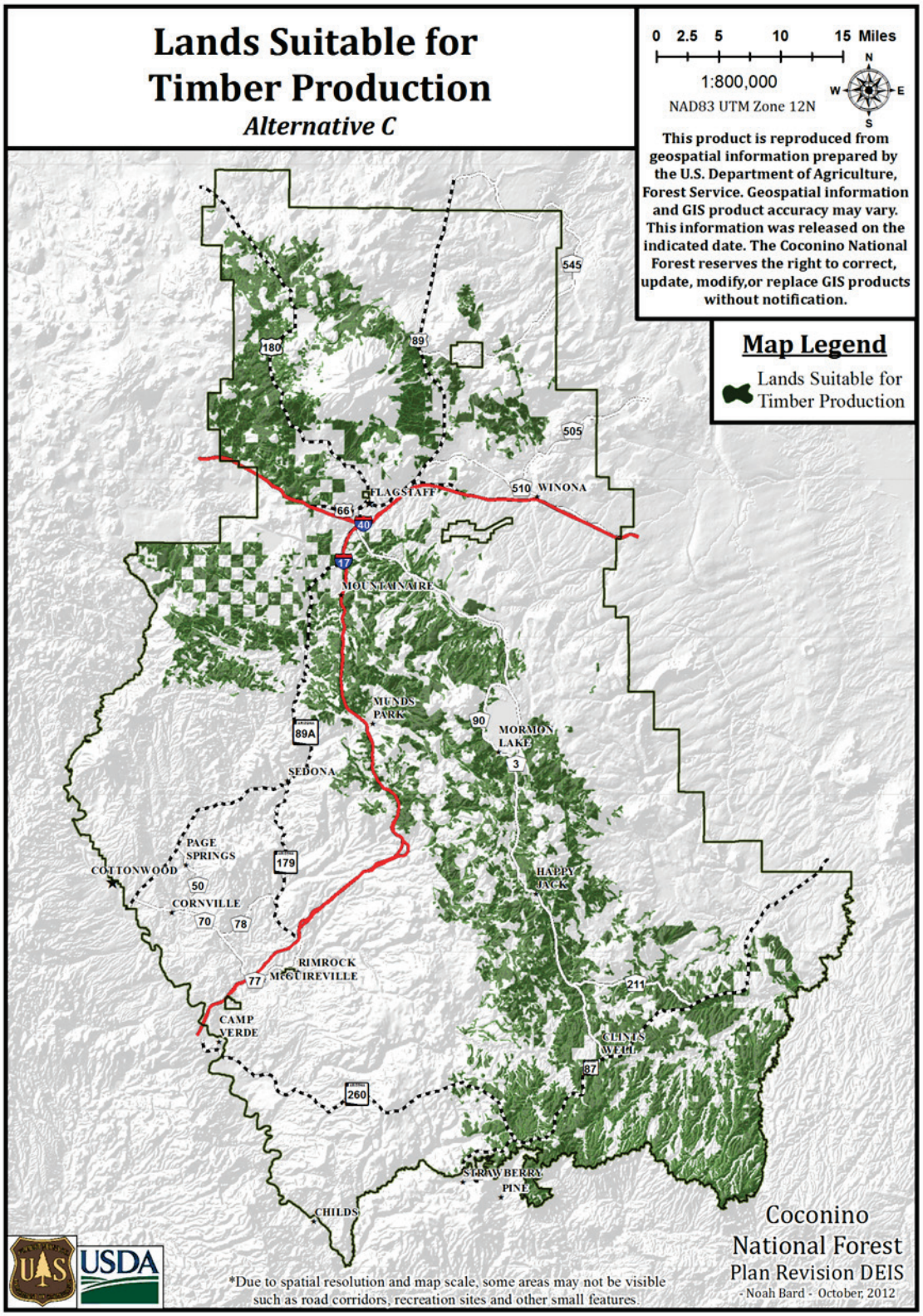


Map 32. Lands Suitable for Timber Production – Alternatives B and D



Map 33. Lands Suitable for Timber Production – Alternative C

Appendix B. Public Collaboration and Involvement/Other Planning Efforts

Introduction

This appendix demonstrates how the Coconino NF integrated the public, stakeholders, and adjacent landowners into the various phases of its land management plan revision effort. The first section of the appendix, "Public Collaboration and Involvement," articulates the ways in which the Coconino NF informed the public and other stakeholders about the development of the plan and invited involvement into the development processes. The second section of this appendix, "Coordination with Other Planning Efforts," briefly discusses the planning and land use policies of adjacent landowners and the ways in which the Coconino NF took those planning efforts into consideration in its own plan revision effort.

Interruptions of the Coconino National Forest Planning Process

When plan development for the Coconino NF started in 2006, the planning team followed direction under the 2005 Planning Rule, which had been finalized by the U.S. Forest Service and published in the Federal Register on December 22, 2004. The following year, on March 30, 2007, the U.S. District Court for the Northern District of California issued an injunction that ordered the Forest Service to discontinue use of the 2005 Planning Rule. The Coconino NF complied with the court order, and further planning activities undertaken were in compliance with laws and rulings not affected by the injunction. Much of the information and public comments gathered prior to the injunction remained useful in the planning effort. Work continued until finalization of the 2008 Planning Rule on April 21, 2008. At that time, plan development began following guidance from the 2008 rule.

A little over a year later, on June 30, 2009, the 2008 Planning Rule was enjoined by the U.S. District Court for the Northern District of California and the development of the Coconino NF plan was again temporarily suspended. The U.S. Department of Agriculture subsequently determined on December 18, 2009, that plans could be amended, revised, or developed using the 2000 Planning Rule as amended, which followed the 1982 rule provisions. The Coconino NF planning effort moved forward using the 1982 rule provisions and a notice of intent to revise plan was published in the Federal Register on May 12, 2010.

Section I: Public Collaboration and Involvement

Engaging Interested Individuals and Organizations

Informal public involvement occurred prior to the publication of the notice of intent (NOI), starting in mid-2006. Public meetings, information in the Coconino National Forest Annual Stakeholders Report, letters, emails, phone calls, radio announcements, and postings to the Coconino NF Web site were used to share and gather information and encourage participation in the plan revision process. Plan revision team members also gave presentations, went to the field, and met with individuals and groups. Early in the revision effort, four topic-based workgroups were also formed to focus on special areas and socioeconomic, ecological, and species diversity. Information collected from the public was used to identify the needs for change discussed in the "Analysis of the Management Situation" (AMS) (Forest Service, 2010). Topics brought forward by the public and other agencies were then summarized in the AMS and presented to the Coconino NF leadership team. Some of these topics included species diversity, special

management areas, livestock grazing, roads and trails, fuel reduction, forest products and industry, water and riparian areas, open space, land exchanges, and places of interest.

After publication of the NOI, the Coconino NF held two rounds of open house/workshop style public meetings—one round in November 2010 and another in March 2011—to: (1) provide information on the current status of plan revision; (2) present, discuss, and request review of draft language in the proposed plan; (3) receive input regarding whether the proposed plan adequately addressed the needs for change; and (4) identify other issues/concerns which still needed to be addressed. Public meetings were held in Flagstaff, Cottonwood, Happy Jack, and Camp Verde. The plan revision team also held "office hours" at locations in Flagstaff, Happy Jack, and Sedona to allow additional opportunities for the public to discuss the proposed plan with plan revision team members in a more one-on-one setting.

Public input gathered from these meetings, as well as written comments, were used to further refine the proposed plan including: clarifying the important ecological function of old-growth forest and their presence/distribution on the landscape; adding guidelines to reduce road impacts to wildlife and watershed condition, as well as encouraging collaboration with partners to improve habitat connectivity across the landscape; designation of Cottonwood Basin Fumeroles as a geological special area; and the addition of desired conditions to research natural areas (RNAs) to guide grazing management in those areas. Public input that could not be integrated into the proposed plan was used in the development of alternatives to the proposed plan.

Many interactions with the public and other stakeholders were held during the plan revision timeframe (2006 to 2011) throughout the State of Arizona, some of which are included in table 1.

Table 1. Plan revision interactions with the public and other stakeholders during 2006 to 2011

Date	Event	Location
4/13/2006	Meeting with the Grand Canyon Wildlands Council	Flagstaff, AZ
4/19/2006	Meeting with USFWS	Flagstaff, AZ
5/4/2006	Meeting with agencies/public	Flagstaff, AZ
5/12/2006	Meeting with AZGFD	Flagstaff, AZ
6/6/2006	Meeting with Greater Flagstaff Forest Partnership, Community Forest Forum	Flagstaff, AZ
6/8/2006	Meeting with Governor's Oversight Council	Flagstaff, AZ
8/25/2006	Multi-Tribal Meeting (Hopi, Hualapai, Yavapai-Prescott)	Flagstaff, AZ
9/18/2006	Meeting with USFWS and AZGFD	Flagstaff, AZ
9/20/2006	Public meeting	Flagstaff, AZ
10/3/2006	1st round – public meeting	Happy Jack, AZ
10/4/2006	1st round – public meeting	Flagstaff, AZ
10/5/2006	1st round – public meeting	Winslow, AZ
10/7/2006	1st round – public meeting	Phoenix, AZ

Date	Event	Location
10/11/2006	1st round – public meeting	Camp Verde, AZ
10/20/2006	Meeting with species diversity focus groups	Flagstaff, AZ
10/25/2006	Meeting with species diversity focus groups	Flagstaff, AZ
11/1/2006	Multi-Tribal Meeting (Hopi Tribe, Navajo Nation, Hualapai Tribe, Yavapai-Prescott Tribe)	Flagstaff, AZ
11/2/2006	Multi-Tribal Meeting (Hopi Tribe, Navajo Nation, Hualapai Tribe, Yavapai-Prescott Tribe, Pueblo of Acoma)	Flagstaff, AZ
11/13/2006	2nd round – public meeting	Camp Verde, AZ
11/14/2006	2nd round – public meeting	Happy Jack, AZ
11/15/2006	2nd round – public meeting	Flagstaff, AZ
11/16/2006	2nd round – public meeting	Winslow, AZ
11/17/2006	Governments meeting (State, County, City)	Phoenix, AZ
11/17/2006	Governments meeting (State, County, City)	Flagstaff, AZ
11/18/2006	2nd round – public meeting	Phoenix, AZ
11/28/2006	Meeting with species diversity focus groups	Flagstaff, AZ
12/17/2006	Cameron Chapter Meeting, Navajo Nation	Cameron, AZ
1/19/2007	Leupp Chapter Meeting	Leupp, AZ
1/31/2007	Navajo Nation Meeting	Window Rock, AZ
02/06/2007	Meeting with species diversity groups	Flagstaff, AZ
2/13/2007	Public Mtgs. – Great Flagstaff Forest Partnership	Flagstaff, AZ
2/14/2007	Meeting with ecological diversity focus groups	Flagstaff, AZ
2/16/2007	Leupp Chapter Meeting	Leupp, AZ
2/21/2007	Meeting with species diversity groups	Flagstaff, AZ
3/11/2007	Tuba City Chapter Meeting	Tuba City, AZ
3/18/2007	Cameron Public Meeting	Cameron, AZ
3/26/2007	Meeting with species diversity focus groups	Flagstaff, AZ
8/8/2007	Multi-Tribal Meeting (Havasupai, Hopi, Hualapai, Kaibab Paiute, Navajo, Tonto Apache, Yavapai-Apache, Yavapai-Prescott) to discuss Kaibab and Coconino NFs plan revision efforts	Williams, AZ
1/12/2008	Public Meeting	Flagstaff, AZ
3/19/2008	Verde Valley Planners Meeting	Cottonwood, AZ
4/4/2008	FPR Update at annual Wildlife Agencies Coordination Meeting (with USFWS and AZGFD)	Flagstaff, AZ
4/16/2008	Verde Valley Planners Meeting	Cottonwood, AZ

Date	Event	Location
4/29/2008	Presentation at Verde Valley Regional Plan symposium	Cottonwood, AZ
9/17/2008	Verde Valley Planners Meeting	Cottonwood, AZ
1/6/2009	Meeting with Friends of Walnut Canyon	Flagstaff, AZ
2/21/2009	Community Conversation on Sustainability	Flagstaff, AZ
3/31/2009	FPR Update at annual Wildlife Agencies Coordination Meeting (with USFWS and AZGFD)	Flagstaff, AZ
6/27/2009	Meeting with AZ Coalition of Conservation Groups	Flagstaff, AZ
7/16/2009	Attended Rogers Lake Stakeholder Meeting	Flagstaff, AZ
7/22/2009	Participated in Walnut Canyon Study Meeting	Flagstaff, AZ
10/5-8/2009	Participated in Collaborative Conservation in Rapidly Changing Landscapes Conference	Flagstaff, AZ
3/30/2010	FPR Update at annual Wildlife Agencies Coordination Meeting (with USFWS and AZGFD)	Flagstaff, AZ
4/7-8/2010	Participated in Nature Conservancy Climate Adaptation Workshop	Flagstaff, AZ
7/26/2010	Potential Wilderness Public Meeting	Flagstaff, AZ
7/27/2010	Potential Wilderness Public Meeting	Sedona, AZ
8/24/2010	Attended Verde Valley Land Preservation Institute Meeting	Cottonwood, AZ
9/14/2010	Meeting with Hopi, Hualapai, Havasupai, Yavapai-Apache	Flagstaff, AZ
9/15/2010	Meeting with Hopi, Hualapai, Havasupai, Yavapai-Apache	Flagstaff, AZ
10/07/2010	Meeting with Grand Canyon Wildlands Council, Sierra Club, Arizona Wilderness Coalition	Flagstaff, AZ
10/19/2010	Presentation at Village of Oak Creek Community Meeting	Sedona, AZ
11/8/2010	Open House and Public Meeting	Flagstaff, AZ
11/9/2010	Open House and Public Meeting	Cottonwood, AZ
11/10/2010	Open House and Public Meeting	Happy Jack, AZ
12/07/2010	Session in Forest Service Meeting with the Hopi Tribe	Flagstaff, AZ
1/4/2011	Community Conversation on Sustainability Meeting	Flagstaff, AZ
1/14/2011	Participation in Regional Plan Meeting – Green Spaces Inventory	Flagstaff, AZ
1/11/2011	Session in Forest Service Meeting with the Hopi Tribe	Kykotsmovi, AZ
1/21/2011	Meeting with USFWS and Arizona Game and Fish Department	Flagstaff, AZ
1/27/2011	Meeting with City of Flagstaff, Sustainability and Climate Change	Flagstaff, AZ
2/23/2011	Intertribal Meeting (Havasupai Tribe, Yavapai- Apache Tribe, Yavapai-Prescott Tribe)	Flagstaff, AZ
2/24/2011	"Office Hours" – Public Q&A Session	Flagstaff, AZ

Date	Event	Location
2/25/2011	Attended Diablo Trust Meeting	Flagstaff, AZ
2/26/2011	"Office Hours" – Public Q&A Session	Sedona, AZ
3/1/2011	Public Meetings	Flagstaff, AZ
3/2/2011	Public Meetings	Camp Verde, AZ
3/4/2011	"Office Hours" – Public Q&A Session	Blue Ridge, AZ
3/7/2011	Meeting with Keep Sedona Beautiful	Sedona, AZ
3/8/2011	"Office Hours" – Public Q&A Session	Sedona, AZ
3/14/2011	Presentation to Sierra Club	Flagstaff, AZ
3/30/2011	FPR Update at annual Wildlife Agencies Coordination Meeting (with USFWS and AZGFD)	Beaver Creek Ranger Station
4/6/2011	Meeting with National Park Service	Flagstaff, AZ
4/7/2011	Presentation at Payson Tea Party Meeting	Payson, AZ
5/12/2011	Meeting with Arizona Department of Transportation (ADOT)	Flagstaff, AZ
5/27/2011	Phone call with Grand Canyon Wildlands Council	Flagstaff, AZ
7/14/2011	Participation in City of Flagstaff Community Design Charette	Flagstaff, AZ
10/19/2011	Participation at 4 Agency Partnership Meeting (Bureau of Land Management, ADOT, Federal Highways Administration)	Phoenix, AZ
11/1/2011	Meeting with City of Flagstaff – Highway 180 Winter Traffic Study	Flagstaff, AZ
11/14/2012	Meeting with Conservation Study Forum	Flagstaff, AZ
12/11/2012	Meeting with Keep Sedona Beautiful	Sedona, AZ
8/6/2013	Meeting with USFWS and AZGFD	Flagstaff, AZ
9/18/2013	Presentation at the 12th Annual Biennial Conference of Science and Management on the Colorado Plateau, Northern Arizona University	Flagstaff, AZ

Media Used in Public Involvement

Beginning in 2006, plan revision information and process updates were periodically emailed and less frequently mailed to individuals and organizations listed and maintained in the Coconino National Forest plan revision ACCESS database, as well as posted on the Coconino National Forest Plan Revision Web site (http://www.fs.fed.us/r3/coconino/plan-revision.shtml). News releases and public meeting/open house announcements were also shared with the public via email, the Coconino NF Twitter feed, and/or local newspapers. The Coconino NF placed information and meeting notices and announcements in several State and local newspapers: the Arizona Daily Sun (Flagstaff, AZ), Red Rock News (Sedona, AZ), Camp Verde Journal (Camp Verde, AZ), Verde Independent (Cottonwood, AZ), and Camp Verde Bugle (Camp Verde, AZ).

Table 2 includes some examples of the various types of these communications shared with the public and stakeholders:

Table 2. Examples of communications shared with the public and stakeholders

Date	Event
8/2006	Announcement of forest plan revision hard copy mailing
9/2006	Notification of 10/2006 and 11/2006 public meeting dates – email and hard copy mailing to tribes, public, and government agencies
11/3/2006	Email announcement of public meetings
11/6/2006	News release via email
11/10/2006	Email announcement that Web site updated
3/07/2007	Email about opportunity to present special area proposals
7/12/2007	Tribes - Hard copy mailing requesting comments on wilderness recommendations
8/23/2007	Email sharing information about plan revision in light of enjoined 2005 Planning Rule
9/8/2007	Tribes – Hard copy mailing requesting comments/involvement in plan revision
3/28/2008	Revision update via web site and email
5/17/2010	Email notification that notice of intent was published
7/9/2010	Email news release via email and hard copy mailing about public meetings on wilderness
8/2010	Revision update via web site
9/2010	Revision update via web site and email
10/2010	Revision update via web site
11/2010	Revision update via web site, email, and hard copy mailing
11/5/2010	Tribes – hard copy mailing, inviting involvement in public meetings, offering tribal-specific FPR meetings
11/19/2010	Tribes – email to tribes offering individual meetings, sharing FPR web site and info from Nov. public meetings
12/2010	Revision update via web site and email
1/2011	Revision update via web site and email
2/14/2011	Revision update via web site, email, and hard copy mailing
2/25/2011	Email reminder about March 2011 public meetings
3/2011	Revision update via web site, email, and hard copy mailing (included “Potential Wilderness Evaluation Report” information).
4/2011	Revision update via web site and email
5/2011	Revision update via web site, email, and hard copy mailing
9/2011	Revision update via web site and email

Information Made Available to the Public on the Forest Plan Revision Web Site

Under the 2008 Planning Rule, two reports were prepared and released to the public: the "Economic and Social Sustainability Assessment" was released in March 2008, and the "Ecological Sustainability Report" was released in May 2010. Although these two reports were developed under the 2008 Rule, the information remained valid and met the requirements for development of the third document used to inform the initial revision process, the "Analysis of the Management Situation," which was developed under the 1982 Rule Provisions and released in 2010.

These reports were made available on the Coconino NF Web site and in other forms by request. A notice of intent published in the Federal Register announced the availability of these reports, as well as the forest's intent to revise its forest plan based on identified needs for change. Notification of availability of these reports was made with electronic and hard copy mailings, as well as on the Coconino NF Web site. Comments received on the reports are available for review in the planning record file located at the Coconino NF Supervisor's Office in Flagstaff, AZ.

A "User's Guide to the Draft Revised Forest Plan" was provided to attendees of the March 2011 public meetings and posted to the Coconino NF Web site in March 2011 following the public meetings. This document was intended to provide guidance for individuals interested in reading, reviewing, and commenting on the draft revised forest plan. Additionally, several frequently asked questions documents were made available at meetings and electronically to provide more detailed information on the plan revision process, potential wilderness issues, and amendment 12 concerns.

Multiple versions of the draft plan language and accompanying maps/figures/tables (November/December 2010 and February/March 2011) were made available to public via meetings, mailings, email distribution lists, and the forest plan revision Web site. Posting of these and other documents to the Web site began in 2006. In addition to the provision of plan revision team contact information on nearly all documents made available to the public electronically or at meetings, a link on the plan revision Web page to an electronic comment form has allowed visitors to comment on any document or planning issue at any time.

Other plan development documents throughout the revision process were made available on the Coconino NF Web site (see table 3)http://go.usa.gov/gnzY:

Table 3. Other plan development documents made available on the Coconino NF Web site

Analysis of Management Situation and Supporting Documents
Notice of Intent to Revise Coconino NF Forest Plan
Analysis of Management Situation
Ecological Sustainability Report
Economic and Social Sustainability Assessment
Response to Public Feedback on Economic and Social Sustainability Assessment
Wilderness Documents
Potential Wilderness Frequently Asked Questions
Draft Potential Wilderness Area Evaluation Report
Draft Coconino NF Wilderness Need Evaluation
Draft Potential Wilderness Evaluation Inventory and Capability Results
Potential Wilderness Evaluation Process
Response to Feedback
Grazing Guidelines for Wilderness
Grazing Management within Wilderness
Background Documents and Other Information
1987 Coconino NF Forest Plan
Values, Attitudes, and Beliefs Toward National Forest System Lands: Arizona Tribal Peoples
Values, Attitudes, and Beliefs Toward National Forest System Lands: The Coconino National Forest
Evaluating the Economic Contribution of the National Forests of Arizona: Supplement to the 2005 Socioeconomic Assessments
Socioeconomic Assessment for the Coconino National Forest
Arizona National Forest Socioeconomic Assessments Manager's Summary Report
Annotated Bibliography for Arizona National Forest Socioeconomic Assessments
Region 3 Planning Web Site
NFMA Plan Model
NFMA Planning Directives

Tribal Government Consultation

Thirteen federally recognized tribes have ties to the Coconino NF:

Fort McDowell Yavapai Nation
Hopi Tribe
Hualapai Tribe
Havasupai Tribe
Navajo Nation
Pueblo of Acoma
Pueblo of Zuni
San Carlos Apache Tribe
San Juan Southern Paiute Tribe
Tonto Apache Tribe
Yavapai –Apache Nation
Yavapai–Prescott Tribe
White Mountain Apache Tribe

The Coconino NF first notified all of the above tribes of forest plan revision in September 2006, with a letter announcing the start of the revision process and the dates for the first round of public meetings. Information sharing has continued throughout the plan revision process, both in written correspondence and face-to-face meetings. The plan revision team has sent written communications to the tribes and has held several plan revision sessions and meetings specifically for tribal government and tribal members. Many of the forest plan revision-related tribal events and communications that occurred during the revision timeframe (2006 to 2011) are included in table 4 below:

Table 4. Plan revision-related tribal events and communications during 2006 to 2011

Date	Tribal Event or Communication	Location
8/25/2006	Multi-Tribal Meeting (Hopi, Hualapai, Yavapai-Prescott)	Flagstaff, AZ
9/8/2006	Hard copy mailing - notification of start of forest plan revision process, announcement of public meeting dates for first round of meetings, offer of individual FPR meetings	
11/1/2006	Multi-Tribal Meeting (Hopi Tribe, Navajo Nation, Hualapai Tribe, Yavapai-Prescott Tribe)	Flagstaff
11/2/2006	Multi-Tribal Meeting (Hopi Tribe, Navajo Nation, Hualapai Tribe, Yavapai-Prescott Tribe, Pueblo of Acoma)	Flagstaff
12/17/2006	Navajo Nation - Cameron Chapter Meeting	Cameron, AZ
1/19/2007	Navajo Nation - Leupp Chapter Meeting	Leupp, AZ
1/31/2007	Navajo Nation - Window Rock Chapter Meeting	Window Rock, AZ
2/16/2007	Navajo Nation - Leupp Chapter Meeting	Leupp, AZ
3/11/2007	Navajo Nation - Tuba City Chapter Meeting	Tuba City, AZ
3/18/2007	Navajo Nation – Cameron Chapter Meeting	Cameron, AZ
7/12/2007	Hard copy mailing - requesting comments on Wilderness recommendations	

Date	Tribal Event or Communication	Location
8/8/2007	Multi-Tribal Meeting (Havasupai, Hopi, Hualapai, Kaibab Paiute, Navajo, Tonto Apache, Yavapai-Apache, Yavapai-Prescott) to discuss Kaibab and Coconino NFs plan revision efforts)	Williams, AZ
9/8/2007	Hard copy mailing, requesting involvement and comments on plan revision	
9/14-15/2010	Meeting with Hopi, Hualapai, Havasupai, Yavapai-Apache	Flagstaff, AZ
11/5/2010	Hard copy mailing, inviting involvement in public meetings, offering tribal-specific FPR meetings	
11/19/2010	Email to tribes offering individual meetings, sharing FPR web site and info from Nov. public meetings	
12/07/2010	Session in Forest Service Meeting with the Hopi Tribe	Flagstaff, AZ
1/11/2011	Session in Forest Service Meeting with the Hopi Tribe	Kykotsmovi, AZ
2/23/2011	Intertribal Meeting (Havasupai Tribe, Yavapai- Apache Tribe)	Flagstaff, AZ

Federal, State, County, and Local Agency Coordination and Assistance

Table 5 lists the Federal, State, county, and local agencies that participated or assisted in the development of the draft plan since the initiation of plan development. No Federal agency requested cooperating agency status during the DEIS development.

Table 5. Government agencies that participated in plan development

Federal
U.S. Dept. of Agriculture Apache-Sitgreaves National Forests Kaibab National Forest Prescott National Forest Tonto National Forest Rocky Mountain Research Station Southwestern Regional Office Natural Resources Conservation Service
U.S. Department of the Interior Bureau of Land Management Bureau of Indian Affairs Bureau of Reclamation Fish and Wildlife Service National Park Service
U.S. Department of Defense – Army Corps of Engineers
U.S. Department of Energy
U.S. Department of Transportation – Federal Highway Administration
U.S. Environmental Protection Agency

U.S. Federal Energy Regulatory Commission
U.S. Senators The Honorable John McCain The Honorable Jon Kyl
U.S. Representatives The Honorable Paul Gosar The Honorable Ben Quayle The Honorable Trent Franks The Honorable Gabrielle Gifford
State
Arizona Department of Environmental Quality
Arizona Game and Fish Department
Arizona Department of Mines and Minerals
Arizona Department of State Lands
Arizona Department of Transportation
Arizona Department of Water Resources
Arizona State Forestry Division
Arizona State Parks
Arizona Geological Survey
Office of the Governor
Arizona State Senators
Arizona State Representatives
Northern Arizona Council of Governments
Northern Arizona University
Arizona State University
University of Arizona
Coconino County Cooperative Extension
Yavapai County Cooperative Extension
County
Coconino County
Yavapai County
Gila County
Local
City of Flagstaff
City of Sedona
City of Winslow
City of Phoenix
Town of Camp Verde

Town of Clarkdale
Town of Cottonwood
Town of Payson
Village of Oak Creek
Beaver Creek Communities – Lake Montezuma, McGuireville, Rimrock
Camp Navajo
Cornville
Happy Jack/Long Valley/Clint's Well
Munds Park
Page Springs
Pine
Strawberry
Winona

Section II: Coordination with Other Planning Efforts

Introduction

Provisions of the 1982 Planning Rule state that the responsible line officer shall review the planning and land use policies of other Federal agencies, State and local agencies and governments, and American Indian tribes. This review should include consideration of objectives as expressed in their plans and policies, an assessment of interrelated impacts of these plans, a determination of how each forest plan deals with the impacts, and where conflicts arise, consideration of alternatives for resolution of conflicts.

The Chief of the Forest Service, Tom Tidwell, has called for an "all-lands approach" to land management, which involves adjacent stakeholders and Federal agencies, State agencies, local governments, and American Indian tribes working together across boundaries to determine common goals for the landscapes they share. To ensure that the Coconino NF's "all-lands" stakeholders' land management objectives were carefully considered, resource-related topics raised in Federal, State, local government management plans, and policies have been identified and taken into account by the Coconino NF in the development of its proposed plan. In the themed sections below, plan components that address these resource-related topics are listed.

Note: To highlight the importance that the Coconino NF places on coordination with its "all-lands stakeholders," proposed plan language that addresses the manner in which the Coconino NF will continue collaborate with those stakeholders has been <u>underlined</u> in this appendix for emphasis.

These resource-related topics have been grouped into several themes as they pertain to the forest:

- ecosystem health and wildlife;
- land adjustments and exchanges;
- open space; and
- recreation.

Topics raised in tribal management plans are addressed in this appendix under Resource-Related Themes.

The Coconino NF has attempted to best address the resource-related topics identified in other plans and policies in the various ways described below and, as a consequence, the forest has made a constructive contribution to the attainment of the plan and policy objectives of its adjacent stakeholders and agencies. For detailed information on interrelated impacts, please see the appropriate resource areas' cumulative effects sections of the final environmental impact statement.

The Coconino NF has determined that its proposed plan is in alignment with the resource-related topics of importance to its adjacent stakeholders and agencies and offers opportunities for coordinating with partners across administrative boundaries, particularly Federal, State, local, and tribal agencies.

"All-Lands" Stakeholders

Below is a list of many of the Coconino NF's adjacent stakeholders and Federal agencies, State and local agencies, and governments. Following the list of stakeholders are the thematic groupings of resource-related topics raised in agency and government planning and policy efforts which indicate how the Coconino NF addressed the topics of interest in its proposed plan.

Federal Agencies

The following is a list of Federal agencies which had resource-related topics relevant to the Coconino NF raised in their planning and policy efforts.

Department of the Interior – National Park Service

The Coconino NF is adjacent to or near six national monuments: Walnut Canyon, Sunset Crater, Wupatki, Montezuma Castle, Montezuma Well, and Tuzigoot. The areas in which these national monuments are found include varied elevation and vegetation types, from remote and undeveloped zones of desert and mountain ranges, to urban interface zones near Flagstaff, Cottonwood, Camp Verde, and other communities. These lands sustain a wide range of activities and resources.

Resource Management Plans (RMP) exist for each national monument. The decisions in the each RMP only apply to the USDI-administered lands within the boundaries of the respective national monument.

The Walnut Canyon Study is a joint initiative of the U.S. Forest Service and National Park Service to explore management options for an area of land surrounding Walnut Canyon National Monument, primarily administered by the Coconino National Forest. The Coconino County Board of Supervisors and city of Flagstaff City Council supported additional protection of lands surrounding the monument and requested Federal authorization for a special resources and land management study for purposes of determining how best to protect these lands from future development. On March 30, 2009, President Barack Obama signed into law the Omnibus Public Land Management Act of 2009 (the act) as passed by the United States Congress. The act includes language directing the Secretary of Agriculture and the Secretary of the Interior to

conduct a special study on management options for an area within the Flagstaff Ranger District of the Coconino NF and surrounding Walnut Canyon National Monument (managed by the NPS).

The objectives for the study regarding management of the Walnut Canyon Study Area are to assess each of the following potential land management designations:

- The suitability and feasibility of designating all or part of the study area as an addition to Walnut Canyon National Monument (to be managed by the NPS), in accordance with section 8(c) of Public Law 91-383 (16 U.S.C. 1a-5(c);
- Continued management of the study area by the Forest Service; or
- Any other designation or management option that would provide for protection of resources within the study area; and continued access to, and use of, the study area by the public.

Federal Highway Administration - Federal Lands Highway Program

The role of the Federal Highway Administration (FHWA) is to ensure that America's roads and highways are safe and technologically up-to-date. Although most highways are owned by State, local, and tribal governments, FHWA provides financial and technical support. The Federal Lands Highways Program funding provides dollars for roads and highways within federally owned lands, such as national forests. In addition to funding, FLHP provides planning, design, and engineering services to support the highways and bridges that provide access to and within federally owned lands (Federal Highway Administration. 2011).

National Guard Bureau/Arizona Army National Guard - Camp Navajo: Integrated Resource Management Plan

As stewards of public lands, the National Guard Bureau (NGB) and Arizona Army National Guard (AZARNG) are charged with protecting the existing natural and cultural features of Camp Navajo. "Camp Navajo's Draft Integrated Resource Management Plan" is currently under review.

U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service (FWS) administers the Endangered Species Act (ESA). Section 7 (1)(1) of the ESA directs Federal agencies to aid in conservation of listed species and section 7 (1)(2) requires that agencies, through consultation with the FWS, ensure that their activities are not likely to jeopardize the continued existence of listed species or adversely modify designated critical habitat. As projects and activities are planned, forest managers consult with the FWS (Fish and Wildlife Service. 2011). The FWS issues national polices to promote the conservation and recovery of listed species, including species recovery plans and the Coconino NF submitted its review of the 2011 "Draft Mexican Spotted Owl Recovery Plan" in August of 2011.

In 2005, a regionwide amendment was made to all forest plans completed in the 1980s and a subsequent biological opinion was completed by the FWS. In May 2010, the Forest Service within the Southwestern Region (Arizona and New Mexico) re-initiated consultation on the regionwide amendment to those 1980s forest plans. A Forest Service biological assessment was submitted to FWS in April 2011. The FWS completed its biological opinion for the Coconino National Forest on March 30, 2012.

In September 2010, the FWS released its strategic response to climate change, "Rising to the Urgent Challenge: *Strategic Plan for Responding to Accelerating Climate Change."* This strategic response includes goals to work with partners to develop a national fisheries and wildlife adaptation strategy and to engage partners in collaborative conservation in which solutions to the impacts of climate change are sought.

U.S. Forest Service

The Coconino NF coordinated with its neighboring national forests also undergoing plan revision, working to edge-match maps, and coordinate management direction across forest boundaries. In addition, the Coconino NF is one of the four forests involved in the landscape-scale Four Forest Restoration Initiative (4-FRI) and, as such, the Coconino NF collaborated with the Kaibab, Apache-Sitgreaves, and Tonto NFs to coordinate its plan revision with the planning of that initiative to ensure that restoration activities would be compatible with the guidance and desired conditions of the proposed plan.

Apache-Sitgreaves National Forests

The Apache-Sitgreaves National Forests (Apache-Sitgraves NFs) is broken into five separate ranger districts, with the westernmost ranger district, Black Mesa, bordering the Coconino NF. The Apache-Sitgreaves NFs working draft of the revised plan dated March 2011 was used to determine interactions between guidance found in the Coconino NF proposed plan. No conflicts were found in the Apache-Sitgreaves working draft of its revised plan. However, in May 2011, the Apache-Sitgreaves NFs experienced the catastrophic Wallow Wildfire, the largest wildfire in the history of Arizona and, as a result, is currently reviewing and adjusting its revision effort to account for the wildfire's significant impacts. The Coconino NF will continue to coordinate with the Apache-Sitgreaves NFs on its planning effort.

Kaibab National Forest

The Kaibab National Forest (Kaibab NF) is broken into three separate ranger districts. They are found both north and south of Grand Canyon National Park and near Williams, AZ. The southernmost district is the Williams Ranger District which shares a boundary with the Coconino NF east and north of Williams, Arizona. The Kaibab NF working draft of the revised plan dated May 2011 was used to determine interactions between guidance found in the Coconino NF proposed plan. No conflicts were found in the Kaibab NF working draft of its revised plan.

Prescott National Forest

The Prescott National Forest (Prescott NF) is broken into three separate ranger districts that surround Prescott, Arizona. The Chino Valley and Verde Ranger Districts share a boundary with the Coconino NF. The Prescott NF working draft of the revised plan available on its Web site in June 2011 was used to determine interactions between guidance found in the Coconino NF proposed plan. No conflicts were found in the Prescott NF working draft of its revised plan.

Four Forest Restoration Initiative (4-FRI)

The Coconino, Kaibab, Apache-Sitgreaves, and Tonto NFs are actively engaged in a collaborative, landscape-scale initiative designed to restore fire-adapted ecosystems in the Southwestern Region. Together with a diverse group of stakeholders, the four forests are working to collaboratively plan and carry out landscape-scale restoration of ponderosa pine forests in northern Arizona. The overall goal of the 4FRI is to create landscape-scale restoration approaches

that will provide for fuels reduction, forest health, and wildlife and plant diversity at no cost to the government. The 4-FRI working draft of its proposed action was used to determine interactions between guidance found in the Coconino NF proposed plan. No conflicts were found in the 4-FRI working draft Proposed Action.

State

Resource-related elements of eight State of Arizona agencies or departments' plans and policies are discussed here and are compared to components of the Coconino NF proposed revised plan in the thematic topic section below.

Arizona Department of Agriculture

The Arizona Department of Agriculture is the State's regulatory agency for agriculture, including animals, plants, and environmental services. Title 3 of the Arizona Revised Statutes contains the provisions related to agricultural topics such as dangerous plant pests and diseases, pesticides, brands and marks, and seizure of livestock. Their mission is to regulate and support Arizona agriculture in a manner that encourages farming, ranching, and agribusiness while protecting consumers and natural resources. (Arizona Department of Agriculture 2010)

The proposed plan includes plan components to continue treatment of invasive exotic plant species.

Arizona Department of Environmental Quality

The mission of the Arizona Department of Environmental Quality (ADEQ) is to protect and enhance public health, welfare, and the environment in Arizona. ADEQ serves as the State's environmental regulatory agency in the areas of air and water quality and waste programs. Forest management activities strive to be in compliance with the applicable Arizona Revised Statutes, particularly Title 49 which outlines specifics such as water quality standards and total maximum daily loads (Arizona Department of Environmental Quality 2011).

Maintaining or improving watershed integrity is included in ecosystem health, one of three focus areas for plan revision. It includes providing desired water quality in rivers, streams, seeps, and springs on the Coconino NF. Desired conditions, objectives, and standards and guidelines provide direction for improving or maintaining water quality. Maintaining air quality is also addressed in the proposed plan.

Arizona Department of Transportation

The Arizona Department of Transportation (ADOT) is responsible for planning, building, and operating the Arizona State highway system.

Corridor Management Plans: A corridor management plan (CMP) is a community planning document that looks at entire scenic and/or historic routes and inventories and documents the special qualities, characteristics, features, and resources of that byway. The document is a planning effort outlining a vision/blueprint for corridor improvements, complete with suggestions to enhance the natural views/scenery. The plan regulates only the land within the ADOT right-of-way.

Several existing and pending CMPs cover routes that are within the boundaries of, and/or adjacent to, the Coconino NF. Some of these routes include, but are not limited to, the Sedona/Oak Creek Canyon Road, San Francisco Peaks Road, and Historic Route 66.

"The State Long-Range Transportation Plan": ADOT is in the midst of updating their long-range plan. As of January 2011, the goals and objectives of this plan were final. The full plan is scheduled for completion by June 2011 and includes the following goals and objectives: improve mobility and accessibility, link transportation and land use, support economic development, promote natural, cultural, and environmental resources, and strengthen partnerships.

"The State Transportation Improvement Program (FY 2011 – 2014)" identifies statewide priorities for transportation projects. It is a compilation of projects utilizing various Federal funding programs and includes highway projects on the city, county, and state highway systems, as well as projects in the national parks, U.S. Forest Service, and Indian Reservation roads. This is a 4-year project list compiled in cooperation with the Federal Highway Administration, Federal Transit Administration, Council of Governments, and the Metropolitan Planning Organizations (MPOs). Projects are selected for inclusion in the State Transportation Improvement Program (STIP) based on adopted procedures and criteria

"The Tentative Five-Year Transportation Facilities Construction Program (2012-2016)" sets forth a plan for developing projects and accounts for spending funds for the next 5 years. All projects in the first 2 years of the program will be fully funded and ready to advertise within the year programmed, or sooner, as determined by the State Transportation Board. The last 3 years of the program will be illustrative in nature and used to establish an implementation plan for projects moving through the various development phases needed prior to the construction of the project. The program includes the following sections: Highway Program, Regional Transportation Plan Freeway Program, and Airport (Arizona Department of Transportation 2010).

Arizona Department of Water Resources

The mission of the Arizona Department of Water Resources (ADWR) is to secure long-term dependable water supplies for Arizona. ADWR administers and enforces the State's groundwater code and surface water rights laws. Title 45 of the Arizona Revised Statutes contains the provisions related to water and groundwater resources (Arizona Department of Water Resources 2011).

The focus area of maintaining or improving watershed integrity also includes providing desired water quantity and timing of delivery. Plan components for aquatic systems, vegetation, and fire are included in the proposed plan.

Arizona Game and Fish Department

"The Wildlife 2012, Strategic Plan for the Years 2007-2012" provides management direction for the department's program of work. The plan has several strategic themes: wildlife, to include resources and wildlife recreation; people, to include recreation and partnerships; business management; and staff (Arizona Game and Fish Department 2007).

"The Arizona State Wildlife Action Plan: 2012-2022" (previously titled "Arizona's Comprehensive Wildlife Conservation Strategy"), was approved in 2006 and provides the vision

for managing Arizona's fish, wildlife, and wildlife habitats. The plan contains several key elements which may provide information for, or have an impact on, Coconino NF management:

- distribution and abundance of wildlife;
- locations and condition of key habitats and community types;
- problems that may adversely affect species in their habitats;
- proposed conservation actions for habitats and species and implementation priorities;
- proposed monitoring plans for: species, effectiveness of conservation actions, adapting conservation actions;
- procedures to review the Arizona State Wildlife Action Plan;
- plans to coordinate with Federal, State, and local agencies and Indian tribes on the plan; and
- broad public participation (Arizona Game and Fish Department 2006).

"The Coconino County Wildlife Connectivity Assessment: Report on Stakeholder Input" (March 2011) provides background information on the importance and benefits of conserving wildlife linkages for both people and wildlife in Coconino County. It is an initial assessment of wildlife movement patterns to be supplemented in the future by further analysis and refinement that includes additional stakeholder input, GIS-based linkage modeling, and research studies of wildlife movement patterns.

Arizona State Forestry Division

The Arizona State Forestry Division's mission is to manage and reduce wildfire risk to Arizona's people, communities, and wildland areas and provide forest resource stewardship through strategic implementation of forest health policies and cooperative forestry assistance programs. The AZSF provides for the prevention and suppression of wildland fire on 22 million acres of State Trust land and private property located outside incorporated communities.

Arizona was required by the 2008 Farm Bill to develop a State Forest Resource Assessment. Arizona completed an assessment of forest resources, developed a strategic plan and laid out a 5-year approach to funding projects in June 2010. Although U.S. Forest Service coordination was a requirement of the assessment, the emphasis of the State plan was on State forest lands, as well as private forestry and urban forestry, and not generally on NFS lands. The Secretary of Agriculture approved the plans in 2010.

Arizona State Land Department

The practice of allocating public lands for various beneficiaries in Arizona dates back to the founding of the territory in 1863. The current system of managing these lands, referred to as State Trust lands, was established with the Arizona State Land Department (AZSLD) in 1915. Since its inception, the AZSLD has been granted authority over all trust lands as well as the natural products they provide. This authority over trust land is central to the AZSLD's primary mission of maximizing revenues for its beneficiaries, a role that distinguishes it from other agencies charged with management of public lands (e.g., national parks, national forests, state parks). As of 2008, the AZSLD managed over 9 million acres in land holdings for 14 beneficiaries, the most prominent of which is the K-12 public school system. Most of the State lands can be used for

livestock grazing purposes only. Public use of the lands is regulated by permit (Arizona State Land Department 2011).

The AZSLD may dispose of (i.e., exchange) or lease the lands for natural resource use or commercial development purposes. The AZSLD prepares a 5-year plan that represents potential areas of concern to initiate land sales and long-term leases. As of November 2011, this plan was not available.

Arizona State Parks

The mission of the Arizona State Parks (ASP) is to manage and conserve Arizona's natural, cultural, and recreational resources for the benefit of the people, both in our parks and through our partners (Arizona State Parks, 2010). Arizona State Parks manage several parks across Arizona. Five of those State parks are near the Coconino NF: Riordan Mansion State Historic Park, Red Rock State Park, Slide Rock State Park, Dead Horse Ranch State Park, and Fort Verde State Park. Arizona State Parks have seen a continual increase in visitation over the years, with over 1,000,000 visitors in 1985 to over 2,000,000 visitors in 2010 (Arizona State Parks, 2010).

"The 2008 Arizona Statewide Comprehensive Outdoor Recreation Plan" (SCORP) identifies the State's outdoor recreation priorities. Several action items have the potential to influence NFS lands:

- Look holistically across geographic boundaries, disciplines, governments, private interests, and generations and examine all benefits and costs, not just fiscal costs. (In reference to growth).
- Expand options such as private landowner incentive programs and recreational liability laws, which would allow public access across private and State and Federal leased lands.
- Provide for OHV use on public lands but manage it properly to reduce conflicts with other recreation users and minimize the activity's impacts on natural and cultural resources, as is standard for other recreational activities. Implement standards for constructing sustainable OHV routes; involve user groups in planning, building, and maintaining satisfactory routes and facilities; and enact and enforce consistent OHV laws and regulations.
- State and Federal agencies should implement coordinated interagency planning efforts for new recreational areas and trail systems to ensure an equitable regional distribution of desired recreational opportunities and access to natural environments.

As of 2007, the SCORP also identified the major impacts and trends related to outdoor recreation in Arizona. Arizona offers a wide variety of outdoor recreation opportunities with 6 national forests, 21 national park sites, 8 national wildlife refuges, 8 Bureau of Land Management field offices, 21 American Indian tribes, 27 State parks (as of November 2011), 23 State wildlife areas, and hundreds of county and city parks and recreation areas. These public lands provide opportunities for activities such as picnicking, developed and primitive camping, wilderness backpacking, hiking, mountain biking, horseback riding, cross-country skiing, wildlife watching, hunting, fishing, boating, water skiing, rock climbing, four-wheel driving, motorized trail biking, all-terrain vehicle riding, and snowmobiling, among others (Arizona State Parks, 2007).

"The Arizona Trails 2010: State Motorized and Nonmotorized Recreation Trails" plan provides information and recommendations to guide Arizona State Parks and other agencies in their management of trails. The priority recommendations for motorized trails are: protect access to trails/acquire land for public access; maintain and renovate existing trails and routes; mitigate and restore damage to areas surrounding trails, routes, and areas; and establish and designate motorized trails, routes, and areas. The priority recommendations for nonmotorized trails are: maintain existing trails, keep trails in good condition; and protect access to trails/acquire land for public access (Arizona State Parks, 2009).

Governor's Forest Health Council: Statewide Strategy for Restoring Arizona's Forests

"The Statewide Strategy for Restoring Arizona's Forests" focuses attention on the current condition of our forests and the steps required to restore their health and vigor. It describes approaches for achieving long-term ecosystem restoration, fire risk reduction around communities, natural fire management in wildlands, and the development of appropriate restoration-related economic opportunities. Based on sound ecological and social science, the Statewide strategy incorporates valuable insights and techniques from the successful and innovative efforts already underway in Arizona. The primary purpose of the Statewide strategy is to foster the implementation of a comprehensive, systematic effort to restore the ecological integrity of Arizona's forests and woodlands, while at the same time describing how rural communities can benefit from their aesthetic, ecological, and economic resources without compromising forest health and public safety.

Local Government

The Coconino National Forest resides in three counties (Coconino, Yavapai, and Gila Counties), covering approximately 1.8 million acres. County or city comprehensive plans can be used as a source of information on the history of land use within the region, the patterns of development, desired conditions, and current county land use policies. County governments hold no legal authority over independent jurisdictions such as Federal and State lands, incorporated cities and towns, or Native American tribal reservations.

Coconino County

Land under management by the Forest Service makes up 28 percent of Coconino County with most acres within the Coconino and Kaibab National Forests. No conflicts between the Coconino County goals and objectives and Coconino NF proposed plan components have been discovered.

The **"Coconino County Comprehensive Plan (2003)"** serves as a long-range guide for the future, with goals that provide general direction, and policies that specify the location, form, purpose, and acceptable impacts of development. The plan sets a course for balance between growth, development, and conservation. The elements include natural environment, water resources, parks and recreation, community character, and land use (Coconino County Community Development Department 2003).

The **"Flagstaff Regional Plan"** is a development and preservation guide for the city and its surrounding region. The plan contains 22 elements, to include open space and the environment; each element was carefully analyzed and subsequent goals were developed based upon public input and research. Goals and policies for all of the elements will be formally adopted by the Coconino County Board of Supervisors and Flagstaff City Council before being ratified by the voters in 2014.

City of Flagstaff

The **"Picture Canyon Coordination Plan"** sets forth the land use, management, and treatment of existing uses of the Picture Canyon area acquired by the city of Flagstaff. The elements of this plan details the manner in which the city of Flagstaff will effectively coordinate and carry out transfer of ownership from the State Land Department to the city of Flagstaff to guarantee the protection of existing uses while allowing for the conservation of the natural, cultural, and open space values at Picture Canyon. Coconino County and the city of Flagstaff are long-standing partners in ongoing efforts to restore and preserve Picture Canyon.

The "**Climate Resiliency and Preparedness Study"** helps address the question of how the city can reduce its vulnerability to and build local resilience against risk from climate variability and weather related impacts. The city conducted the resiliency and preparedness study to better understand how the impacts of local climate changes will directly affect city operations. Building local resiliency within the municipal organization to these changes helps ensure continued prosperity.

Yavapai County

The purpose of the **"Beaver Creek Community Vision (Vision 2020)"** is to guide Yavapai County in making decisions and setting priorities in order to promote orderly development . It organizes and coordinates complex relationships between land, resources, people, and facilities to protect the health, safety, welfare, and convenience of the residents of the community. Further, it sets a direction for growth and change. Vision 2020 applies to private lands where Yavapai County has planning and zoning authority. Objectives in the plan are tied to planning and zoning, transportation, water resources, open space and recreation, and youth and family services.

The **"Sedona Community Plan (Imagine Sedona 2020 and Beyond)"** is a statement of community goals and development policies including maps and text that set forth objectives, principles, standards and proposals. The community plan is the "road map" for achieving community objectives. The plan guides the city in making decisions about new development and re-zonings, preparing new regulations and ordinances, initiating more specific planning programs, and setting priorities and funding. The community plan update is due to be adopted by the end of 2012 and voted on by Sedona's citizens in 2013.

The "**Verde Valley Regional Land Use Plan"** enhances the shared qualities of special places to live and enjoy the outdoor environment. Maintaining distinct community character is a high priority that encourages diverse living opportunities in a small town atmosphere. Open space preservation, a variety of housing choices, appropriate use of public lands, and transportation connections that complement the region's spaciousness are key components for a balanced land-use pattern (Community Sciences Corporation In Association with Dava & Associates; Lima & Associates (2006).

The **"Yavapai County Comprehensive Plan"** was adopted by the board of supervisors in 2012. The revised plan covers eight topic areas: land use, transportation, water and open space, energy, environment, cost of development, and growth areas. In 2010, the county began its plan revision effort and has decided, based on the past 10 years of population growth, the revised plan will cover 8 topic areas rather than the 4 discussed in the 2003 plan. In addition to the land use, transportation, water and open space, the revised plan will explore the issues of growth areas, cost of development, environment, and energy. The revised plan is expected to be finalized and distributed by September 2012 (Yavapai County 2003).

Community Wildfire Protection Plans

- Blue Ridge and Mogollon Rim Communities Wildfire Protection Plan (January 2010)
- Flagstaff and Surrounding Communities Wildfire Protection Plan
- Greater Williams Area Community Wildfire Protection Plan
- Tusayan Community Wildfire Protection Plan

A community wildfire protection plan is a strategic plan as well as an action plan: it generates a broad operating framework for landowners and resource managers within the area, and identifies community protection priorities. Site specific planning and implementation remains the responsibility of each owner/management agency, generally operating within the guidelines developed within of the plan. A combination of fuel management, FireWise standards, and appropriate wildfire suppression response will reduce threats to life and property, protect values-at-risk, and create a safe context for the use of fire in subsequent forest ecosystem restoration efforts. This plan outlines actions needed to prepare and equip the community to live and thrive within our fire-adapted ponderosa pine forests.

Resource-Related Themes

To ensure that the Coconino NF's "all-lands" stakeholders' land management objectives were carefully considered, resource-related topics raised in Federal, State, local government management plans, and policies have been identified and taken into account by the Coconino NF in the development of its proposed plan. In the themed sections below, plan components that address these resource-related topics are listed.

Note: To highlight the importance that the Coconino NF places on coordination with its "all-lands stakeholders," proposed plan language that addresses the manner in which the Coconino NF will continue to collaborate with those stakeholders has been <u>underlined</u> in this appendix for emphasis.

Ecosystem Health and Wildlife

New knowledge of forest ecosystems has prompted the Coconino NF to shift its management focus from timber outputs to the maintenance and improvement of ecosystem health. As such, maintenance and improvement of ecosystem health is one of the three areas identified in the proposed plan as priority needs for change.

The following agencies and governments identified ecosystem health and wildlife as an element in their planning and policy efforts:

Federal

- Department of the Interior – National Park Service
- Federal Highway Administration – Federal Lands Highway Program
- U.S. Fish and Wildlife Service
- U.S. Forest Service

State

- Arizona Department of Agriculture
- Arizona Department of Environmental Quality
- Arizona Department of Transportation
- Arizona Department of Water Resources
- Arizona Game and Fish Department
- Arizona State Forestry Division
- Arizona State Parks
- Governor's Forest Health Council: Statewide Strategy for Restoring Arizona's Forests

Local

- Beaver Creek Community Vision – Vision 2020
- National Guard Bureau/Arizona Army National Guard – Camp Navajo
- Coconino County Plans
- City of Flagstaff – Picture Canyon Coordination Plan
- Community Wildfire Protection Plans
- Sedona Community Plan (Imagine Sedona 2020 and Beyond)
- Verde Valley Regional Land Use Plan
- Yavapai County Comprehensive Plan

Language in Proposed Revised Plan that Addresses this Issue

Significantly, all plan components in the proposed plan contribute to sustaining native ecological systems by managing towards appropriate conditions that support native plant and animal diversity. The concepts of forest restoration, watershed protection, resilience to changing climate and invasive exotic species, and wildlife conservation are integrated throughout the proposed plan.

The proposed plan includes new direction relevant to forest resilience; changed frequency and severity of natural disturbances in fire-adapted ecosystems; the decline of aspen; the loss of understory species; lack of current plan direction regarding rarer ecosystems; and susceptibility to catastrophic disturbances, climate change, invasive exotic species, and connectivity. Updated language in the proposed plan includes the following topics: soil, riparian zones, aquatic, water resources, changing climate, habitat connectivity, noninvasive species, vegetation, and increased collaboration with adjacent landowners, agencies and governments, organizations, and other stakeholders.

Language Specific to Wildlife, Fish, and Plants in Proposed Revised Plan

Forestwide Desired Conditions in Wildlife, Fish, and Plants

- **FW-WFP-DC-1:** Sustainable populations of native and desirable nonnative plant and animal species, including special status species, are supported by healthy ecosystems and ecologically responsible forest activities and reflect the diversity, quantity, quality, and capability of natural habitats on the forest[1]. Human-made or altered habitats may be necessary to support populations in the short term, but in the long term, species are enhanced and/or returned to natural habitat.
- **FW-WFP-DC-2:** Habitats for special status species support viable, self-sustaining populations. Ecological conditions provide habitat for federally listed and other special status species. Habitat conditions contribute to the survival and recovery of listed species, allow for repatriation of extirpated species, contribute to the delisting of species under the Endangered Species Act of 1973 (P.L. 93-205), preclude the need for listing new species, improve conditions for Southwestern Region sensitive species, and keep common native species common.
- **FW-WFP-DC-3:** Habitat conditions provide the resiliency and redundancy necessary to maintain species diversity and metapopulations. Habitats have the soil characteristics and native vegetation to support the species that are dependent on them.
- **FW-WFP-DC-4:** Streams and other aquatic systems have sufficient clean water, substrates, bank structure, and other features to provide high quality species habitat which benefits survival, growth, reproduction, and migration of associated native species. Properly functioning stream ecosystems provide habitat for native and desirable nonnative species and are resilient to disturbances.
- **FW-WFP-DC-5:** Habitats throughout the Coconino NF include the microclimate or smaller scale elements needed for rare plants and animals. The structure and function of the PNVTs and associated microclimate or smaller scale elements (e.g., special features, rock piles, specific soil types, and wet areas) exist in adequate quantities to provide habitat and refugia for narrow endemics, species with restricted distributions, and Southwestern Region sensitive species.
- **FW-WFP-DC-6:** Vegetation and stream connectivity provide for wildlife, fish and plant species movements and genetic exchange consistent with landforms and topography.

[1] See sections in the plan related to terrestrial and aquatic habitats for additional descriptions of desired conditions for habitats.

Species are able to access adjoining habitat, disperse, migrate, and meet their life history requirements.

- **FW-WFP-DC-7:** Ephemeral and intermittent stream courses function as nesting habitat and movement corridors for species.
- **FW-WFP-DC-8:** Human-caused physical barriers or habitat alterations (e.g., temperature changes, loss of streamflow) do not exclude species from their historic habitat or exclude them from using stream courses. Barriers to movement are located where necessary to protect native fish from nonnative species until watershed restoration allows connectivity to be restored.
- **FW-WFP-DC-9:** Old-growth attributes such as multistory structure; large, old trees; large trees with sloughing, exfoliating bark; snags; large downed logs; and other indicators of decadence are present in all forest and woodland vegetation types, providing habitat for the associated species.
- **FW-WFP-DC-10:** All age classes of deciduous trees (e.g., aspen, maple, Gambel oak) within the forest PNVTs are well represented and provide habitat for wildlife and rare plants.
- **FW-WFP-DC-11:** The forest is known for high-quality hunting and fishing opportunities. There is more emphasis, interest, and opportunity to fish for native sport fish. Nonnative sport fish and habitats are managed in locations and ways that do not pose substantial risk to native species.
- **FW-WFP-DC-12:** Residents and visitors have ample opportunities to experience, appreciate, and learn about the forest's wildlife, fish, and plant resources.

Forestwide Standard in Wildlife, Fish, and Plants

- **FW-WFP-S-1:** Direction for species listed as threatened, endangered, proposed, or candidate takes precedence over direction for species not listed by the U.S. Fish and Wildlife Service.

Forestwide Guidelines for Wildlife, Fish, and Plants

- **FW-WFP-G-1**: Habitat management objectives and species protection measures from approved recovery plans should be applied to activities occurring within federally listed species habitat to promote recovery of the species.
- **FW-WFP-G-2:** To improve the status of species and prevent Federal listing, management activities should comply with species conservation agreements, assessments, and strategies.

- **FW-WFP-G-3:** Fire suppression techniques that minimize disturbance impacts should be used where there are listed and Southwestern Region sensitive species.
- **FW-WFP-G-4:** Seasonal timing restrictions should be applied for threatened, endangered, and sensitive species; bats; and golden eagles to protect known nests, roosts, and other special features from habitat alteration and/or disturbance from management activities to avoid disruption of species or their habitats that could affect survival or successful reproduction.
- **FW-WFP-G-5:** To provide for northern goshawk nesting habitat, post-fledgling areas (PFAs), and nest areas should be designated. A minimum of six nest areas (known or

replacement) should be located per territory. Goshawk nest and replacement nest areas should include known nests and generally be located in drainages, at the base of slopes, and on northerly (northwest to northeast) aspects. Nest areas should generally be 25 to 30 acres in size. In order to provide habitat while young goshawks are maturing, goshawk PFAs of approximately 420 acres in size should be designated surrounding the nest sites. Nest areas and surrounding PFAs should be delineated to include the best available goshawk habitat and generally comprise about 600 acres. PFAs generally have higher basal areas than non-PFAs.

- **FW-WFP-G-6:** Native species populations and habitats, including downstream habitats, should be maintained or improved by using measures that prevent degradation of habitat and the incidental or accidental introduction of disease or nonnative organisms.
- **FW-WFP-G-7:** Where native frogs and toads occur, established protocols should be followed to prevent the introduction and spread of a chytrid fungus (*Batrachochytrium dendrobatidis*) that kills amphibians.
- **FW-WFP-G-8:** Aquatic species should not be transferred through management activities from one 6th code watershed, except for reintroductions or introductions of native species into suitable habitat.
- **FW-WFP-G-9:** All equipment should be cleaned, inspected, and dried before leaving any water body to remove plants, fish, or animals so organisms and disease are not transported among water bodies.
- **FW-WFP-G-10:** Fences should be designed, modified, or removed to minimize impacts on wildlife movement. For example, road right-of-way fences should be located one-eighth of a mile from roads and lay-down fences and should be designed to minimize restriction to pronghorn movement.
- **FW-WFP-G-11:** Construction of additional fences should be minimal. Fence maintenance should be prioritized in threatened, endangered, and sensitive species habitat and important movement corridors and should occur as needed. Fences that are no longer needed should be removed.
- **FW-WFP-G-12:** The use of pesticides, herbicides, or any chemicals should be avoided near bat roosting, foraging, or watering areas to minimize contamination of bats or their prey. If application is necessary, apply techniques to minimize effects (e.g., small-sized spray blocks, application of buffers around roosts and riparian or aquatic habitats).
- **FW-WFP-G-13:** In order to minimize the potential reduction of rare plant populations through accidental collection, seed collection and cuttings should be the preferred collection methods when forest product and research collection permits are issued, unless it is determined that whole plant removal is required to meet the needs of the permittee and would not have the potential to impact rare plant populations[2].
- **FW-WFP-G-14:** Permits for cutting stalks off of agaves should not be issued, in order to protect stalks used as nesting and overwintering habitat for key pollinators of desert ecosystems such as carpenter bees. Exceptions may be made for limited research purposes.

[2] This guideline does not apply to pre-cleared areas for wilding permits of specific species.

Forestwide Management Approaches in Wildife, Fish, and Plants

- Coordinate with Arizona Game and Fish Department regarding hunting recommendations to maintain and improve habitat elements such as vegetation and soil condition and productivity, particularly in montane meadows, riparian PNVTs, and aspen.
- Coordinate with the Arizona Game and Fish Department and the U.S. Fish and Wildlife Service regarding listed and native species; reintroductions or introductions of listed or native species; control or eradication of nonnative species; and the management of sport and native fishes, including the identification of refugia for native fish.
- Coordinate with Arizona Game and Fish Department, U.S. Fish and Wildlife Service, sportsman groups, the scientific community, including the Rocky Mountain Research Station, and other stakeholders about information, education, and knowledge gaps as they relate to promoting and improving wildlife, fish, and plant resources and management. Education opportunities could include collaboration with research partners to provide student and volunteer participation in scientific studies.
- Maintain the native-fish-only status of Fossil Creek and streams free of nonnatives through public education, signage, and law enforcement.
- Refer to the plan implementation guidebooks for plants and invertebrates for project-level guidance. These two guidebooks are intended to be living documents that are periodically updated with new information (Stevens and Ledbetter, 2012; Hodgson and Waring, 2012).
- Coordinate with Northern Arizona Native Seed Association partners and Colorado Plateau Native Plant Partners regarding native plant materials, research, and development.

Land Adjustments and Exchanges

The following agencies and governments identified land adjustments and exchanges as an element in their planning and policy efforts:

Federal

- Department of the Interior – National Park Service - Walnut Canyon Study

State

- Arizona Department of Transportation
- Arizona State Land Department
- Arizona State Parks

Local

- Beaver Creek Community Vision - Vision 2020
- Coconino County Plans
- Sedona Community Plan (Imagine Sedona 2020 and Beyond)
- Yavapai County Comprehensive Plan

Language in Proposed Revised Plan that Addresses this Issue

Forestwide Desired Condition in Land Adjustments

- **FW-LndAdj-DC-2:** Easement rights-of-way help provide adequate access to the forest. Appropriate trail access through private lands is identified and managed or acquired through the private land development process, in cooperation with local governments. Reasonable access is provided to private inholdings.

Forestwide Guidelines in Land Adjustments

- **FW-LndAdj-G-1:** To better promote the mission of the agency, lands that the forest considers for acquisition should have one or more of the following qualities:
  - Contains habitat for threatened or endangered species and sensitive species
  - Contributes to the continuity of wildlife and plant habitat
  - Contains or influences wetlands, riparian areas, or other water-related features
  - Provide needed access, protect public lands from fire or encroachment, or prevent damage to resources
  - Contributes to areas of High or Very High scenic integrity
  - Improves the ability to manage a designated special area.
  - Contains significant sites with cultural, scientific, or recreational values.
- **FW-LndAdj-G-2:** To retain the forest's setting and contribution, lands that the forest is willing to exchange or sell should have one or more of the following qualities:
  - Isolated from other NFS lands
  - Without unique cultural, scientific, or ecological resources
  - Managed for a single commercial or other special use, for which it is being exchanged or sold
  - Has lost its wildland characteristics
  - Lands needed to meet the needs of communities and the public such as land for a water treatment plant.
- **FW-LndAdj-G-3:** When responding to requests for new access permits or easements, easements should be granted in reciprocity to ensure administrative and public access to the forest unless they are inappropriate because of the physical situation of the site or because they would conflict with the areas desired conditions.

Forestwide Management Approaches in Lands Adjustments

- Consult with the local governments about land adjustment proposals the forest plans to take forward into the NEPA process. Public input on land exchange begins at the time a site-specific land exchange is proposed.

- If acquisition cannot occur, collaborate with private land owners and county governments in the land development process to protect unique resources such as scenery, adjacent wilderness, archaeological values, and threatened and endangered species habitat. Encourage local governments or agencies, private landowners, and/or other appropriate entities (e.g., The Nature Conservancy, Trust for Public Land, Archaeological Conservancy, and local land trusts) to protect the resources and character of the national forest through methods such as conservation easements, land trust management, deed restrictions, or public acquisition of adjacent, high-priority parcels.
- Work with landowners and local and regional governments to encourage policies and development practices that conserve open space, reduce wildfire risk, and retain ecosystem benefits. Provide input to the design requirement of new developments (especially when they are adjacent to the forest) and participate in community growth planning efforts. Participate as a government liaison concerning open space issues. Continue linking city and county trails to Forest Service trails. Share public outreach and education tools and information about future plans.
- Support open space designations adjacent to the forest to minimize conflicts between residents and other forest users. Review and participate in local government plans to encourage open space objectives that are consistent with national forest management direction and policies.
- Work with local and regional governments and road agencies to develop transportation solutions that reduce traffic and vehicle impacts on national forest lands.
- Work with homeowner associations and homeowners in the Flagstaff and Sedona neighborwoods management areas to plan and implement measures that reduce wildfire threats to life and property such as:
    - Providing reasonable road ingress and egress for emergency evacuation of personnel.
    - Providing reasonable road access suitable for use by fire engines, including places to turn engines around.

Sedona/Oak Creek Management Area-Standards-Land Adjustments

- **MA-SedOak-S-7:** Land exchanges that dispose of national forest land in the Sedona/Oak Creek MA will occur only if they result in acquisition of national forest lands in the Sedona/Oak Creek MA.
- **MA-SedOak-S-8:** Land exchanges that dispose of national forest land in The Dells area will occur only if they result in acquisition of high-priority private parcels elsewhere in the Sedona/Oak Creek MA. High-priority private parcels total approximately 95 acres (see appendix A in the proposed plan, map 13). High-priority land acquisition parcels include: Lincoln Canyon (25 acres) and Hancock Ranch (70.3 acres).
- **MA-SedOak-S-9:** Base-for-exchange lands are national forest lands located at: Chapel of the Holy Cross area (approximately 11 acres, Sedona Neighborwoods MA), Slide Rock area (approximately 13 acres, Oak Creek MA), Village of Oak Creek Golf Course area (approximately 5 acres, Sedona Neighborwoods MA) and The Dells area (up to 300 acres, Sedona/Oak Creek and House Mountain-Lowlands MAs).
- **MA-SedOak-S-10:** Base-for-exchange lands at the Chapel of the Holy Cross area is intended for church acquisition only; base-for-exchange at Village of Oak Creek Golf Course is intended for golf course acquisition.

Sedona Oak Creek Management Area – Guidelines – Land Adjustments

- **MA-SedOak-G-14:** Priority parcels in the Sedona/Oak Creek Management Area[3] should be acquired from willing sellers through methods other than land exchanges, when possible.
- **MA-SedOak-G-15:** National forest parcels less than or equal to 10 acres in size in the Sedona/Oak Creek MA could be disposed of under the Small Tracts Act of 1983 (P.L. 97-465), Townsite Act of 1958 (P.L. 85-569), or General Exchange Act of 1922 (U.S.C. 16 485,486) to resolve encroachment issues or provide lands needed for public purposes.
- **MA-SedOak-G-16:** Slide Rock base-for-exchange land should be available for acquisition by Slide Rock State Park to better facilitate management of the creek and the park.

  (For land adjustment guidelines for the Sedona/Oak Creek MA, see forestwide direction.)

Open Space

The Coconino NF recognized the need to acknowledge open space values and included that concept in community-forest interaction, one of the three areas identified in the proposed plan as priority needs for change. The following agencies and governments identified open space as an element in their planning and policy efforts:

Federal

- U.S. Fish and Wildlife Service
- U.S. Forest Service

State

- Arizona Game and Fish Department
- Arizona State Lands Department
- Arizona State Parks
- Governor's Forest Health Council: Statewide Strategy for Restoring Arizona's Forests

Local

- Beaver Creek Vision 2020
- Coconino County Plans
- City of Flagstaff – Picture Canyon Coordination Plan
- Sedona Community Plan (Imagine Sedona 2020 and Beyond)
- Verde Valley Regional Land Use Plan
- Yavapai County Comprehensive Plan

[3] Priority parcels are those listed in the standards and guidelines for Sedona/Oak Creek MA.

Language in Proposed Revised Plan that Addresses this Issue

Forestwide Desired Condition in Livestock Grazing

- **FW-Graz-DC-1:** Rangelands provide large areas of unfragmented open space. These open spaces sustain biological diversity and ecological processes and help to preserve the rural landscape and cultural heritage of central and northern Arizona.

General Description in Land Adjustments

- Land exchange and land purchase have been, and will continue to be, the means by which the Coconino NF acquires key wildland resources and open space areas.

Forestwide Desired Condition in Land Adjustments

- **FW-LndAdj-DC-1:** The Coconino NF has a mostly contiguous land base that provides for biologically diverse public lands with minimal impacts from adjacent land uses. Most of the forest has a natural-appearing landscape that has not lost its wildland character. Open space values are retained, including those related to naturally appearing landscapes, wildlife habitat, riparian/wetland character, and recreational opportunities.

Forestwide Management Approaches in Land Adjustments

- Work with landowners and local and regional governments to encourage policies and development practices that conserve open space, reduce wildfire risk, and retain ecosystem benefits. Provide input to the design requirement of new developments (especially when they are adjacent to the forest) and participate in community growth planning efforts. Participate as a government liaison concerning open space issues. Continue linking city and county trails to Forest Service trails. Share public outreach and education tools and information about future plans.

- Support open space designations adjacent to the forest to minimize conflicts between residents and other forest users. Review and participate in local government plans to encourage open space objectives that are consistent with national forest management direction and policies.

Forestwide Desired Condition in Scenic Resources

- FW-Scenic-DC-1: The scenic values of the Coconino NF are conserved and enhanced. Visitors see that the forest is being actively managed through visual cues such as seeing fuel breaks with native wildflowers, grasses, and forbs; some fire effects; and tree thinning to frame views from trails and developed recreation sites.

Recreation

The Coconino NF recognized the need to acknowledge the significant changes in types of recreation use on NFS lands and identified recreation as one of the three areas in the proposed plan as priority needs for change. The following agencies and governments identified recreation as an element in their planning and policy efforts:

Federal

- Department of the Interior – National Park Service
- U.S. Fish and Wildlife Service
- U.S. Forest Service

State

- Arizona Game and Fish Department
- Arizona State Land Department
- Arizona State Parks

Local

- Beaver Creek Community Vision - Vision 2020
- Coconino County Plans
- City of Flagstaff – Picture Canyon Coordination Plan
- Sedona Community Plan (Imagine Sedona 2020 and Beyond)
- Verde Valley Regional Land Use Plan
- Yavapai County Comprehensive Plan

Several sections in the proposed plan specifically discuss the various aspects of recreation in great detail: dispersed recreation, developed recreation, motorized recreation, recreation special uses, etc. The various recreations sections include desired conditions, standards, guidelines, objectives, and management approaches.

Specific Language in Proposed Revised Plan that Addresses this Issue

Forestwide Desired Conditions in Recreation

Recreation programs, infrastructure, and services are usable by all people to the greatest extent possible without separate or segregated access for people with disabilities. Information on what conditions recreation visitors will encounter on trails is well advertised at the trailhead. Trails and facilities incorporate principles of universal design.

- **FW-Rec-DC-1:** Recreation programs, infrastructure, and services are useable by all people to the greatest extent possible without separate or segregated access for people with disabilities. Information on what conditions recreation visitors will encounter on trails is well-advertised at the trailhead. Trails and facilities incorporate principles of universal design.
- **Desired Conditions in Land Adjustments**: Appropriate trail access through private lands is identified and managed or acquired through the private land development process, in cooperation with local governments.

Forestwide Management Approaches in Land Adjustments

- Work with landowners and local and regional governments to encourage policies and development practices that conserve open space, reduce wildfire risk, and retain ecosystem benefits. Provide input to the design requirement of new developments (especially when they are adjacent to the forest) and participate in community growth planning efforts. Participate as a government liaison concerning open space issues. Continue linking city and county trails to Forest Service trails. Share public outreach and education tools and information about future plans.

Forestwide Desired Conditions in Special Uses – Recreation Special Uses

- **FW-SpecUse-DC- 7:** Special use activities blend into the landscape and do not draw attention to the activity or equipment. Commercial tours are focused on main roadways and vistas as well as selected recreation locations. They support the Forest Service mission by providing high quality outdoor recreational, educational, and interpretive opportunities. If the need can be demonstrated, commercial tours are allowed to provide opportunities for scenic viewing, natural history education, wildlife viewing, and other activities that are compatible with resource protection, user experiences, and forest direction.
- **FW-SpecUse-DC- 7:** Commercial and recreational activities are consistent with other direction for the location including recreation opportunity spectrum (ROS) objectives, resource protection, and community goals.
- **FW-SpecUse-DC- 8:** Commercial and recreational activities are consistent with other direction for the location including recreation opportunity spectrum (ROS) objectives, resource protection, and community goals.
- **FW-SpecUse-DC- 9:** Livestock used in special use activities does not negatively impact areas where forage is limited.
- **FW-SpecUse-DC- 10:** Outfitter/guide permits or permit use does not cause a significant change for the ROS social or managerial setting such as allowing airboats or seaplanes on the lakes that are at a less developed ROS setting. Motor vehicle use for outfitter-guide activities occurs on roads and trails displayed on the motor vehicle use map or on roads specifically authorized under their permit.
- **FW-SpecUse-DC- 11:** Large group gatherings and recreation event sites provide a range of opportunities from a natural, "outdoor" experience to commercial amenities for visitor comfort. These pre-analyzed sites are generally areas that are compatible with use by the general public and are identified based on their ability to support large group activities with minimal resource impacts. They do not have long-term evidence of erosion or invasive species as a result of special use activities. In general, events occur where they will not disrupt the general public's use of the land.
- **FW-SpecUse-DC- 12:** Recreation residences and commercial facilities on the forest meet state and county health and safety standards. Their footprints are stable with some exceptions to accommodate improvements that address health, safety, and environmental issues. Organization camps managed under special use permits are focused on natural resource values, conservation education, and emphasize nonmotorized recreation opportunities.

Forestwide Objective for Special Uses - Recreation Special Uses

- **FW-SpecUse-O- 1:** Identify 4 pre-approved sites for recreation events and large group gatherings within 10 years of plan approval.

Forestwide Standards for Special Uses - Recreation Special Uses

- **FW-SpecUse-S-1**: Prohibit motorized aircraft landings and takeoffs associated with outfitter-guide activities on National Forest System lands and waters, except for emergencies and rare administrative support activities.
- **FW-SpecUse-S-2**: Require permit holders to rehabilitate user-created trails and other impacted areas created by their activities that were not authorized under their special use permit.

Forestwide Guidelines for Special Uses – Recreation Special Uses

- **FW-SpecUse-G-12:** In order to maintain the recreation setting, outfitter/guide use, when combined with unguided use, should not exceed encounter levels as described in the designated ROS class. Where higher encounter levels are determined to be reasonable, an ROS class inconsistency or exemption is described in the plan (a list of exemptions are found under Sedona/Oak Creek Management Area, Desired Conditions, Dispersed Recreation).
- **FW-SpecUse-G-13:** Outfitter-guide motor vehicle use and camping activities should be excluded from areas with sensitive resource issues, such as a high density of archaeological sites, sensitive wildlife areas (including riparian areas or areas with sensitive or rare plants), and adjacent to urban areas, in order to prevent compaction of soils and overutilization of popular areas.
- **FW-SpecUse-G-14:** To protect riparian vegetation, special use permits should generally not be given for activities proposed to occur within 200 feet of perennial streams, springs, or sensitive waters. Exceptions will be for hardened or slick rock sites or for activities in support of approved research, to improve safety, or to provide for site rehabilitation.
- **FW-SpecUse-G-15:** Commercial and recreational activities should occur during times and in locations that are consistent with the needs of national forest users and area residents.
- **FW-SpecUse-G-16:** Commercial use travel should be limited to roads and trails on the motor vehicle use map, or to sites designated in an operating plan for such use. Exceptions include activities that require very limited access over a short period of time, such as hot air balloon retrieval and similar activities, where this access is specified in the permit.
- **FW-SpecUse-G-17:** Commercial uses should use non-National Forest System lands for their activities when their proposed use is not consistent with national forest goals and can be accommodated on non-National Forest System lands.
- **FW-SpecUse-G-18:** Large group gatherings and recreation events should occur in areas that have already been analyzed for resource issues or suitably developed sites, unless such sites have not yet been identified on a district. Applicants are encouraged to use non-National Forest System land for staging when possible.
- **FW-SpecUse-G-19:** Commercial tours at high interest archaeological sites, such as Honanki, should be consistent with site protection and visitor experience objectives.

- **FW-SpecUse-G-20:** Air tour companies and rock climbing activities should not disturb occupied eyries between March 1 and August 31, to protect the area during the peregrine falcon breeding season and to protect other raptor species sensitive to noise disturbance.
- **FW-SpecUse-G-21:** Additional outfitter/guide activities or group activities should generally not occur in Deadman Wash, Dry Lake Hills, Walnut Canyon from Fisher Point east, and Pumphouse Wash except to improve safety or protect natural resources.
- **FW-SpecUse-G-22:** Special use events should occur on the Snowbowl Road infrequently and should not interfere with use of the area by the general public or permittees near the Snowbowl Ski Area in order to preserve public access to the mountain and facilities.
- **FW-SpecUse-G-23:** Where forage is limited, overnight campers with recreational livestock should carry cubed, pelleted, or rolled feed to prevent overgrazing of camping areas. Feeds should be free of viable noxious weed seeds to prevent introduction of noxious plants.
- **FW-SpecUse-G-24:** Sites preapproved for special use activities should be rated/designed to accommodate a specific number of people in order to provide for resource protection and prevent overutilization.

Management Approaches in Special Uses - Recreation Special Uses

- Priority is given to permit applications received in response to a prospectus issued by the Forest Service. Unsolicited proposals will be evaluated on a case-by-case basis as workload allows.
- Outfitter-guide and recreation event permits may be prevented in areas with heavy recreation use by the general public until an appropriate determination of need and capacity is completed.
- Develop a forestwide or districtwide management plan for administering special use permits, as appropriate.
- Before permitting outfitter-guides in areas adjacent to national monuments, contact the National Park Service (NPS) for coordination. Outfitter guiding might also help meet the mission of NPS in the national monuments or on adjacent national forest lands. Work cooperatively with NPS for special uses requests that occur on both Forest Service and NPS lands.
- Coordinate wildlife viewing permits with the Arizona Game and Fish Department.

American Indian Tribes

Thirteen tribal groups within Arizona have connections with the Coconino NF: the Fort McDowell Yavapai Nation, Hopi Tribe, Hualapai Tribe, Havasupai Tribe, Navajo Nation, Pueblo of Acoma, Pueblo of Zuni, San Carlos Apache Tribe, San Juan Southern Paiute Tribe, Tonto-Apache Tribe, Yavapai-Apache Nation, Yavapai-Prescott Indian Tribe, and White Mountain Apache Tribe.

The following tribes have resource-related plans that are relevant to the Coconino NF.

Navajo Nation Forestry Department – Navajo Nation Forestry Plan

The Navajo Nation Forestry Department manages about 600,000 acres of ponderosa pine and mixed conifer forest and about 4.8 million acres of pinyon-juniper woodlands and provides for the protection and management of the Navajo Nation's forest and woodland resources in a manner that benefits the Navajo Nation and all tribal members.

The **"Hopi Woodland Management Plan"** is an integrated resource management plan for the 197,098 acres of pinyon-juniper woodlands on the Hopi Reservation. The primary objective: protection of woodland spiritual and cultural values while providing tribal members with the opportunity to harvest subsistence amounts of firewood and fencing material.

Hualapai Department of Natural Resources

- Fire management plan includes goals to: (1) protect human safety and property while managing timber and range resources sustainably; (2) maintain adequate air and water quality; and (3) reduce the likelihood of catastrophic fire (Hualapai Department of Natural Resources 2002).
- Forest management plan (1990 to 2000; now being revised).
- Watershed management plan includes identification of nonpoint source pollution sources and associated mitigation actions to improve water quality in the Colorado River and within the Truxton Wash and the Upper Gila watersheds (Hualapai Department of Natural Resources 2006).

To ensure that tribal land management objectives were carefully considered, resource-related topics raised in tribal plans have been addressed in the proposed plan.

***Note**:* To highlight the importance that the Coconino NF places on coordination with tribes, the below proposed plan language that addresses the manner in which the Coconino NF will continue collaborate with tribes has been <u>underlined</u> in this appendix for emphasis.

Specific Language in Proposed Plan that Addresses Tribal Resource-Related Issues

The proposed plan includes a "Tribal Relations and Uses" section dedicated specifically to the relationship the Coconino NF wishes to maintain and foster with American Indian tribes. In addition to that entire section, the following language to address topics of interest to the above American Indian communities.

Forestwide Desired Condition in Wetland/Cienega and Reservoirs/Lakes

- **FW-Aq-Wtlnds-DC-7:** Plants known to be used by tribes that traditionally use the forest are thriving.

Forestwide Management Approach for Springs

- <u>Continue working with partners and stakeholders, including tribes, to inventory, classify, and prioritize springs for restoration. Include consideration of rare and endemic species when evaluating springs for restoration.</u>

Forestwide Guidelines for Wildlife, Fish, and Plants

- **FW-WFP-G-15:** Through discussions with American Indian tribes that collect plants for traditional cultural and ceremonial purposes, growth and regeneration of culturally important plants should be encouraged during forest restoration projects to promote their persistence.

Forestwide Management Approach for Livestock Grazing

- Collaborate with permittees, tribes, educational institutions, other agencies, and stakeholders in achieving and maintaining desired conditions, including invasive species management.

Forestwide Desired Conditions for Forest Products

- **FW-FProd-DC-3:** Timber products are available to businesses and individuals in a manner that is consistent with other desired conditions and on a sustainable basis consistent with vegetative desired conditions. Timber products are available to local American Indian tribes for subsistence and traditional purposes, such as kiva beams.
- **FW-FProd-DC-4:** Collection of forest botanical products is authorized by permit and only when information is available to ensure the product will persist on the forest. Collection of plant species recognized as rare, limited in distribution, threatened, endangered, or sensitive is discouraged except for scientific and cultural purposes. Traditional tribal uses for forest botanical products, such as the collection of medicinal plants, wild plant foods, basketry materials, and firewood, are facilitated. Boughs and herbaceous plant parts used for American Indian traditional and ceremonial purposes are available under conditions and procedures that minimize restrictions and are consistent with laws, regulations, and agreements with tribes.

Forestwide Management Approaches for Forest Products

- Recognize the rights of members of tribes whose aboriginal territories include the land now administered by the Coconino NF to collect forest materials for traditional, ceremonial, and subsistence purposes.
- Encourage tribal members to engage in traditional activities relating to forest botanical products, such as the collection of medicinal plants, wild plant foods, basketry materials, and firewood for traditional and cultural purposes.

Forestwide Desired Conditions for Heritage Resources - Site Conservation and Evaluation

- **FW-Hrtg-DC-1:** Historic and prehistoric sites, including known American Indian sacred places and traditional cultural properties, are preserved and protected for their cultural importance. They are generally free from adverse impacts or impacts are minimized through consultation with those tribes who are descendants of the prehistoric people who have used the area in historic times. Site integrity and stability is protected and maintained on sites that are susceptible to imminent risks or threats, or where the values are rare or unique. Priority heritage assets, the forest's cultural resource "crown jewels," are all stable and their significant values are protected. Vandalism, looting, theft, and human-caused damage to heritage resources are rare. Site significance and integrity are

maintained through conservation and preservation efforts and receive minimal impact from visitors.

- **FW-Hrtg-DC-2:** Cultural and scientific values are continually enhanced through research and partnerships with tribes, universities, and museums. Through interpretation and public involvement in archaeological activities, appreciation and respect of cultural values and a sense of stewardship for our common heritage is increased.

Desired Condition for Volcanic Woodlands
Management Area - Scenery – Desired Landscape Character

- **FW-VolcanWd-DC-1:** The area is valued for its volcanic scenery and distinctive features such as Red Mountain (a designated Geological Area), Cochrane Hill, and other cinder cones and lava flows. Volcanic features such as cinder cones and lava flows are recognized for their cultural and religious importance to several tribes. Located in this MA are Sunset Crater National Monument, Cinder Hills OHV Recreation Area, and Painted Desert Vista. Outside of the Cinder Hills OHV area, cinder cones are generally undisturbed by management activity and the volcanic features maintain their integrity, form, and process. Designated motorized recreation opportunities are valued for their scenic views, even though motorized recreation areas can impact the scenery where they occur.

Management Approach for Volcanic Woodlands Management Area

- Consult with tribes to identify volcanic features of cultural importance in project planning.

Desired Conditions for San Francisco Peaks
Management Area - Scenery – Desired Landscape Character

- **FW-Peaks-DC-4:** The San Francisco Peaks are sacred to many American Indian tribes and are a significant religious and traditional place. There are individual shrines and sacred places that are valued for their cultural setting on the mountain. The area is valued for its heritage resources and cultural importance, spectacular scenery and high scenic integrity, cool climate escape from desert heat, a diverse range of year-round recreation opportunities, and its distinctive landscape features.

Standards for Sedona/Oak Creek Management Area - Lands Special Uses

- MA-SedOak-S-6: Allow plant collection for commercial activities only in the House Mountain-Lowlands MA of the Sedona/Oak Creek MA, except for the legitimate purposes of federally recognized tribes.

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Appendix C. Methodology and Analysis Process

Introduction

This appendix further elaborates on the analyses contained in the main body of the document by providing supplemental information about assumptions, data sources, and/or methodologies used. It is, however, not comprehensive. Other documentation may be found in the project record.

Assumptions Common to All Analyses

The following assumptions were made for all analyses. Additional assumptions are provided in each section, where applicable.

- Land management plans do not have direct effects. They do not authorize or mandate any site-specific projects or activities (including ground disturbing actions). However, there may be implications, or longer term environmental consequences, of managing the forest under this programmatic framework.
- The plan decisions (i.e., desired conditions, objectives, standards, guidelines, management areas, suitability of areas, and monitoring) will be followed when planning or implementing site-specific projects and activities.
- Law, regulation, and policy will be followed when planning or implementing site-specific projects and activities.
- Funding levels will be similar to the past 5 years.
- The planning timeframe for the effects analysis is 10 to15 years; other timeframes may be specified for analysis depending on the resource and potential consequences.
- Specific location, design, and extent of activities implemented under plan alternatives are generally not known because decisions are made on a site-specific (i.e., project-by-project) basis. Therefore, environmental consequences refer to the potential for the effect to occur and are usually only estimates of anticipated effects from implementing plan alternatives. The effects analyses are to be useful for comparing and evaluating alternatives on a forestwide basis. It is not intended to be applied directly to specific locations on the forest.
- Monitoring identified in the chapter 5 of the land management plan (monitoring strategy) will occur throughout the life of the plan.
- The land management plan will be amended as needed during the life of the plan

Maintenance and Improvement of Ecosystem Health

Air Quality

The evaluation of air quality assesses PNVTs together because vegetation type is not as important as other physical factors influencing smoke production from fire. The smoke impacts discussed below consider management actions in the short term (15 years) and then are covered at the end of this section in the long term (50 years).

Actual smoke impacts to communities are dependent on numerous factors that are difficult to predict over the long term such as: ventilation parameters, live and dead fuel moistures, wind direction and speed, firing techniques, timing and duration of ignition, and vegetation type and

coarse woody debris; smoke impacts are related much more closely to these factors than guidance in plan alternatives. Smoke models used at the project level allow the modeler to incorporate real-time data. However, at a programmatic, forestwide scale, the uncertainties associated with these data are too great to allow for reliable analysis using these tools. On this scale, emission concentrations or National Ambient Air Quality Standards (NAAQS)[4] could not be estimated. There are six criteria pollutants for which NAAQS have been set: (1) carbon monoxide (CO), (2) lead, (3) nitrogen dioxide (NO_2), (4) particulate matter smaller than 10 micrometers in diameter (PM_{10}) and particulate matter larger than 2.5 micrometers in diameter ($PM_{2.5}$), (5) ozone, and (6) sulfur dioxide (SO_2) (see table 1). Therefore, estimated smoke impacts focus on trends which require making some assumptions based on interpretation of Arizona Department of Environmental Quality (ADEQ) monitoring and literature. ADEQ uses 3 eBAM[5] monitors in Sedona, Flagstaff, and Camp Verde to monitor particulate matter in the smoke management units (airsheds) associated with the Coconino NF. These monitors provide concentrations in 1-hour, 4-hour, and 24-hour intervals. For this analysis, smoke impacts are assessed in terms of number of burn days and acreage burned per days.

Table 1. National Ambient Air Quality Standards

Pollutant	Primary Standards		Secondary Standards	
	Level	Averaging Time	Level	Averaging Time
Carbon Monoxide	9 ppm (10 mg/m3)	8-hour (1)	None	
	35 ppm (40 mg/m3)	1-hour (1)		
Lead	0.15 µg/m3 (2)	Rolling 3-Month Average	Same as Primary	
Nitrogen Dioxide	53 ppb (3)	Annual (Arithmetic Average)	Same as Primary	
	100 ppb	1-hour (4)	None	
Particulate Matter (PM_{10})	150 µg/m3	24-hour (5)	Same as Primary	
Particulate Matter ($PM_{2.5}$)	15.0 µg/m3	Annual (6) (Arithmetic Average)	Same as Primary	
	35 µg/m3	24-hour (7)	Same as Primary	
Ozone	0.075 ppm (2008 std)	8-hour (8)	Same as Primary	
	0.08 ppm (1997 std)	8-hour (9)	Same as Primary	
	0.12 ppm	1-hour (10)	Same as Primary	

[4] NAAQS are set by Enviornmental Protection Agency regulations under their authority from the Clean Air Act (for more information see Affected Environment).

[5] eBAM is an instrument used to monitor particulate matter. It is produced by Met One.

Pollutant	Primary Standards		Secondary Standards	
	Level	Averaging Time	Level	Averaging Time
Sulfur Dioxide	0.03 ppm (11) (1971 std)	Annual (Arithmetic Average)	0.5 ppm	3-hour (1)
	0.14 ppm (11) (1971 std)	24-hour (1)		
	75 ppb (12)	1-hour	None	

"Season of implementation," or the time of year burns take place, is a factor that greatly influences ventilation and would have more effect on smoke impacts than number of burn days or acreage burned per day; however, this factor is more appropriately evaluated at the project level. While the factors influencing smoke production do vary by season, the plan alternatives do not contain direction or restrictions about seasonality of burning that would drive difference between the alternatives. Project-level decisions about when to burn would vary by the specifics of the site conditions and the desired conditions for the project, as well as ADEQ's enhanced smoke management programs that Federal agencies follow. In addition, climate change may add increased uncertainty when predicting the season of implementation.

Fugitive dust is particulate matter which detaches from the soil and becomes airborne. Like other particulate matter, fugitive dust has the potential to adversely affect human health and visibility. It can be caused by driving on dirt roads, uncovered haul trucks, or soil detaching and becoming airborne under dry, windy conditions with bare soil. Fugitive dust is analyzed using the vegetation types that are most likely to have soil detachment because of dry conditions and amount of bare soil, typically present: Piñon-Juniper Woodlands, Piñon- Juniper Evergreen Shrub, Semidesert Grasslands, Piñon-Juniper with Grass, Interior Chaparral, and Desert Communities. Since motorized vehicle use is limited to roads and trails (except for administrative activities), only publicly open roads were considered for contributing to fugitive dust. These roads would have the most traffic and contribute to soil detachment. Roads that are available for administrative use only would have much lower traffic on a regular basis, and they may for short periods (e.g., during an active timber sale) have higher traffic volumes that contribute to soil detachment. While the timing and conditions of these administrative uses may be adjusted to mitigate fugitive dust, the use of a road by the public is not controllable unless there is a road closure. Consequently, the underlying condition that may vary based on the availability of these roads by alternative is public access on the forest. The analysis for fugitive dust was conducted qualitatively.

Uncharacteristic wildfires are those that occur under vegetative conditions that are not typical to the vegetation types' historic fire regime. In many cases, uncharacteristic wildfires occur under hotter, drier conditions with more continuous fuel, and they grow faster and produce more smoke than fires that burn under conditions that are closer to the historic range of variability. When fires occur under conditions closer to this range, the agency may be able to manage them to maintain the historic range of variability and to benefit wildlife, soils, watersheds, and other ecological components of the respective ecosystem. This environmental impact statement distinguishes

between the types of impacts that occur under uncharacteristic wildfires and wildfires managed to meet resource objectives. This information is based on smoke modeling completed by Mary Lata, fire ecologist for the Four Forest Restoration Initiative[6] team, which estimates the differences between emissions produced by fire occurring under conditions representative of the historic range of variability on-site for the Ponderosa Pine vegetation type on the Coconino and Kaibab NFs, and current conditions (Lata 2011).

Assumptions for Air Quality

In the analysis for air quality, additional assumptions have been made:

- For the forest's annual prescribed fire treatments: 95 percent are in the Ponderosa Pine vegetation type and 5 percent are in the Mixed Conifer with Frequent Fire vegetation type.
- The maximum range for prescribed fire treatment is approximately 30,000 acres per year, and this would only be possible under implementation of the Four Forest Restoration Initiative and/or major changes to fire policy and budgets.
- Wildfires that are managed for resource objectives would be utilized when possible to reduce fuel loading in wildland-urban interface (WUI) areas and to restore natural fire regimes. It is assumed that a range of 5,000 to 50,000 acres are burned annually, with an average of 15,000 acres each year, in the following vegetation types: Ponderosa Pine (90 percent), Mixed Conifer with Frequent Fire (5 percent), Piñon-Juniper with Grass (2.5 percent) Piñon-Juniper Evergreen Shrub (2.5 percent). To mimic the natural fire regime, Ponderosa Pine, Mixed Conifer with Frequent Fire, and Piñon-Juniper with Grass would be managed for low severity fire, while Piñon-Juniper Evergreen Shrub would be managed for mixed severity fire. These percentages are representative of what the forest's currently manages and are based on fuel conditions, smoke management considerations, firefighting capability, leadership and resource availability, and fire policy.
- The Clean Air Act of 1970 mandates that every state have a statewide implementation plan to regulate pollutants. Smoke is regulated with oversight and compliance by the State of Arizona. Arizona's implementation plan requires that Federal and State land management agencies submit the following prior to implementation of a planned ignition: annual registrations, prescribed fire burn plans, and prescribed burn requests and obtain authorizations to burn[7].
- Prescribed fire produces lower emissions than wildfire because less fuel is typically consumed and the conditions are carefully chosen to minimize smoke impacts and to meet resource objectives. A wildfire managed to meet resource objectives would have similar smoke effects to a prescribed fire, given similar fuel conditions and weather.

[6] The Four Forest Restoration Initiative is a collaborative effort to restore forest ecosystems on portions of four national forests in northern Arizona: Apache-Sitgreaves, Coconino, Kaibab, and Tonto.

[7] http://www.azdeq.gov/environ/air/smoke/download/prules.pdf

- The majority of the Coconino NF is comprised of vegetation types that require frequent fire to maintain their historic range of variability. Therefore, smoke from fires is inevitable, regardless of the type of fire that may occur (i.e., wildfires or prescribed fires).
- The use of administrative roads contributes less fugitive dust than public access roads because it can be mitigated at the project level by timing restrictions and site-specific design of projects.
- The presence of a road itself does not generate a measureable amount of fugitive dust unless it is located in the calcareous soils of the Verde Formation. Traffic is the main source of soil detachment from roads.

Aquatic Systems

Watersheds, Water Quality and Quantity

The following describes the methodology and analysis processes used to determine the environmental consequences on watershed condition and water quality and quantity from implementing the alternatives. Environmental consequences are not site specific at the broad forest planning level and will be described with qualitative descriptions supported by past studies and observations. Much of the background information is found in the "Ecological Sustainability Report" (USDA Forest Service 2009b) and its supporting specialists' reports in addition to the initial assessment of watershed condition using the national watershed condition framework and assessment tool conducted in March 2011 (USDA Forest Service 2011d).

Watersheds

Watershed condition is the state of the physical and biological characteristics and processes within a watershed that affect the hydrologic and soil functions that support aquatic ecosystems. Watershed conditions at the 6th code according to the Hydrologic Unit Code (HUC)[8] have been determined and are appropriate to be used at the planning level. The results of the March 2011 initial assessment are presented under "Aquatic Systems" in watershed affected environment. The environmental consequences section provides a qualitative assessment each alternative's forecasted trends for watershed condition based on the concept of concentrating restoration treatments within identified focus watersheds. In a more general sense, the environmental consequences section describes potential effects from forest restoration activities, recreation and roads, grazing, special uses, and climate change on watershed condition.

Water Quality and Quantity

Water quality has been assessed in major perennial stream reaches and lakes on the forest. The general classification used for surface water quality by ADEQ designates each waterbody in one of five categories:

[8] The United States is divided and subdivided into successively smaller hydrologic units which are classified into six levels: regions, subregions, accounting units, cataloging units or subbasins, watersheds, and subwatersheds. The hydrologic units are arranged within each other, from the smallest (subwatersheds) to the largest (regions). Each hydrologic unit is identified by a unique hydrologic unit code (HUC) consisting of 2 to 12 digits based on the 6 levels of classification in the hydrologic unit system.

- **Category 1 (attaining all uses)** - All designated uses of surface waters are assessed as "attaining."
- **Category 2 (attaining some uses)** - Each designated use of surface waters is assessed as either "attaining," "inconclusive," or "threatened."
- **Category 3 (inconclusive)** - All designated uses of surface waters are assessed as "inconclusive" due to insufficient data to assess any designated use (e.g., insufficient samples or core parameters). By default, this category would include waters that were "not assessed" for similar reasons
- **Category 4 (not attaining)** - At least one designated use of surface waters is assessed as "not attaining" and no uses are assessed as "impaired." A Total Maximum Daily Load[9] (TMDL) analysis will not be required at this time for one of the following reasons:
  - **4 A. -** A TMDL has already been completed and approved by the Environmental Protection Agency (EPA) but the water quality standards are not yet attained.
  - **4 B. -** Other pollution control requirements are reasonably expected to result in the attainment of water quality standards by the next regularly scheduled listing cycle.
  - **4 C. -** The impairment is not related to a "pollutant" loading but rather due to "pollution" (e.g., hydrologic modification).
- **Category 5 (impaired)** - At least one designated use of surface waters is assessed as "impaired" by a pollutant. These waters must be prioritized for TMDL development.

Water quality is assessed by comparing existing conditions (Categories 1 to 5) with desired conditions that are set by Arizona under authority of the Clean Water Act. Waters that are not impaired (those not on the 303d[10] list or in Categories 4 or 5) are providing for beneficial uses identified for that stream and can be considered in a desired condition until further sampling indicates impairment. Those in Category 2 or higher require special attention during site-specific project analysis. ADEQ is the regulating authority for water quality in Arizona as promulgated by EPA.

ADEQ also interprets its surface water quality standards to apply to "intermittent, non-navigable tributaries." ADEQ interprets the definition of "surface water" to include tributaries and assigns water quality standards to intermittent surface waters that are not specifically listed by name in Arizona's surface water quality standards rules. ADEQ considers it necessary to regulate and protect these types of waters as "waters of the United States," because it is estimated that approximately 95 percent of the surface waters in Arizona are either intermittent or ephemeral.

[9]A TMDL is a written analysis that determines the maximum amount of a pollutant that a surface water can assimilate (the "load"), and still attain water quality standards during all conditions. The TMDL allocates the loading capacity of the surface water to point sources and nonpoint sources identified in the watershed, accounting for natural background levels and seasonal variation, with an allocation set aside as a margin of safety.

[10] Under section 303(d) of the Clean Water Act of 1972, states, territories, and authorized tribes are required to develop lists of impaired waters. These impaired waters do not meet water quality standards that states, territories, and authorized tribes have set for them, even after point sources of pollution have installed the minimum required levels of pollution control technology. The law requires that these jurisdictions establish priority rankings for waters on the lists and develop TMDLs for these waters. (http://yosemite.epa.gov/R10/WATER.NSF/TMDLs/CWA+303d+List)

Wildfires may either be suppressed or allowed to burn and managed to meet resource objectives. Wildfires that include resource objectives would help maintain or make progress towards desired conditions. A variety of factors were used to determine whether unplanned natural ignitions should be suppressed, and the likelihood of suppression was evaluated for each recommended wilderness. The factors considered included: continuity and availability of fuels; adjacency to and comparative size of existing wilderness; size of recommended wilderness area; topography and existing condition of roads affecting accessibility for equipment or foot travel; and proximity to values at risk such as buildings, water developments, and powerlines. Although wildfires that include resource objectives are authorized in wilderness areas, they are accomplished much less frequently than in areas outside of wilderness mainly because threatened resource values, such as wildlife habitat, heritage resources, and timber values are more difficult to protect due to limitations on accessibility and tools that can be used in suppression or in fire management activities within wilderness areas.

Each recommended wilderness under alternatives B and C were ranked to evaluate their conditions and management implications and how wilderness recommendation would affect fire management response. A range of effects would be expected depending on the time of year and fire behavior. Each recommended wilderness was rated according to the likelihood that wildfires would be suppressed (see “Vegetation and Fire” section for more discussion on this process). These rankings fell into two broad categories used for analysis: (1) lower likelihood of a full suppression strategy and, instead, these wildfires on these acres would likely include resource objectives to move resources toward desired conditions and (2) moderate to higher likelihood of full suppression. Generally, higher rankings carry a higher likelihood of using a full suppression strategy. If a suppression response is implemented and is successful, the number of acres burned would remain small. The probability of this response being successful over the long-term, however, is low. If the suppression response to wildfire is unsuccessful, there is a high probability that fire will burn uncharacteristically through much or all of the recommended wilderness area and the number of acres burned could be high. There would also be a higher probability of adverse impacts to wilderness characteristics from fire suppression efforts. An area was ranked as zero (0) or no difference if the wilderness recommendation did not influence the appropriate response to wildfire. Table 2 shows the wilderness areas with a low likelihood that wildfires would be suppressed and table 3 shows the wilderness areas with a moderate to higher likelihood by PNVT in alternatives B and C.

Table 2. Recommended wilderness areas and associated PNVTs in alternatives B and C[1] with a lower likelihood that wildfires would be suppressed

PNVT[2]	No Difference					Very Low	Low		
	Abineau	Barbershop	East Clear Creek	Railroad Draw	Strawberry Crater	Davey's	Cimmaron-Boulder	Hackberry	Total w/in RWA Only
SDG						132	1,966	4,401	6,499
GBG					2,327				2,327
IC									0
PJG					3,648				3,648
PJES				8		741	9,704	16,035	26,488
PJW			512		607	876	3,476	4,199	9,670
PP	68	851	1,241	1,205	29				3,394
DC							76	94	170
MCA	347								347
MCFF		283							283
MBDRF						30	45	54	129
CWRF							38	348	386
MWRF		170	263						433
MSG				6					6
Totals	**415**	**1,304**	**2,016**	**1,219**	**6,611**	**1,779**	**15,305**	**25,131**	**53,780**

[1] Alternative B includes Strawberry Crater and Davey's recommended wilderness areas; while alternative C includes all recommended wilderness areas.

[2] SDG = Semidesert Grassland, IC = Interior Chaparral, PJG = Piñon-Juniper with Grass, PJES = Piñon-Juniper Evergreen Shrub, PJW = Piñon-Juniper Woodland (Persistent), PP = Ponderosa Pine, DC = Desert Communities, MCA = Mixed Conifer with Aspen, MCFF = Mixed Conifer with Frequent Fire, MBDRF = Mixed Broadleaf Deciduous Riparian Forest, CWRF = Cottonwood-Willow Riparian Forest, MWRF = Montane Willow Riparian Forest, and MSG = Montane/Subalpine Grassland.

Table 3. Recommended wilderness areas and associated PNVTs in alternatives B and C[1] with moderate to very high likelihood that wildfires would be suppressed

PNVT[2]	Moderate	High	High	High	Very High
	Black Mountain	Cedar Bench	Tin Can	Walker Mountain	Deadwood Draw
SDG	2,451	1,972		506	758
GBG					
IC				1,707	
PJG					
PJES	5,594	2,558	2,714	3,474	9,810
PJW	928	1,053	427	665	922
PP			831		245
DC	615	189			42
MCA					
MCFF					
MBDRF	169	11		19	
CWRF	17			7	
MWRF					9
MSG					
Total	**9,774**	**5,783**	**3,972**	**6,378**	**11,786**

[1] Alternative B includes Walker Mountain recommended wilderness area; while alternative C includes all recommended wilderness areas.

[2] SDG = Semidesert Grassland, GBG = Great Basin Grassland, IC = Interior Chaparral, PJG = Piñon-Juniper with Grass, PJES = Piñon-Juniper Evergreen Shrub, PJW = Piñon-Juniper Woodland (Persistent), PP = Ponderosa Pine, DC = Desert Communities, MCA = Mixed Conifer with Aspen, MCFF = Mixed Conifer with Frequent Fire, MBDRF = Mixed Broadleaf Deciduous Riparian Forest, CWRF = Cottonwood-Willow Riparian Forest, MWRF = Montane Willow Riparian Forest, and MSG = Montane/Subalpine Grassland.

Assumptions for Watersheds

In the analysis for watersheds, additional assumptions have been made:

- Focus (or priority) watersheds are the designated watersheds where restoration activities will concentrate on the explicit goal of improving watershed condition. The selection of these watersheds is yet to come; however, once selected, they will be a major consideration for implementation of projects in alternatives B, C, and D.
- The "Watershed Condition Framework" provides a 6-step process for watershed-wide restoration. As of March 2013, the forest has completed Step A: classification of 6th code watershed condition. The remaining steps prioritize, plan, and implement treatments; track accomplishments; and verify and monitor watershed improvement. The actual improvement rate of watershed condition is dependent on funding, internal support levels, and support from other land owners within the focus watershed.

Assumptions for Water Quality and Quantity

In the analysis for watersheds, additional assumptions have been made:

- Data used in this analysis represents forestwide conditions and may not represent water quality or flow conditions at any given point across the landscape. On-site inspection should be conducted for site-specific project assessments. Water quality data for impaired waters or waters not attaining (Categories 4 and 5 and EPA listed waters) is derived from the 2004 and 2006/2008 (most current) ADEQ 305 b reports (ADEQ 2004 and 2006) and EPA listed waters. Water in Categories 1 to 3 is summarized from ADEQ data in the 2004 and 2006/2008 305 b reports (ADEQ 2004 and 2006). A more detailed description of existing water conditions can be found in the Water Resources Specialists Report for the Ecological Sustainability Report for the Coconino NF (Forest Service, 2007).
- Reference or historic water quality was assumed to be sufficient to sustain ecological systems and species and be of equivalent quality as attaining all uses as intended by the State water quality standards. Nonpoint sources of pollution such as roads, timber harvesting, extensive livestock grazing, recreation, and non-characteristic fire were neither widespread nor frequent.
- Reference levels of water yield are unknown; however, research suggests that water yield in pre-settlement, open-canopied ponderosa pine forests was higher than in the closed-canopy forests that are prevalent today (USDA Forest Service 2007). Studies in paired watersheds (i.e., watersheds that are similar in nature with regard to their vegetation and soils) in Arizona have shown that there was a short-term increase in water yield following thinning in ponderosa pine forests (Moir and Ludwig 1979).
- The recent drought, along with overstocked forests, has reduced flows in some stream reaches and some watersheds (Little Colorado River watersheds and Verde River

watersheds). Overall forest water yield[11] has been static to slightly downward over the last 20 years due to the following two conditions.

- Greater tree and shrub basal area and cover has been observed in several vegetation types or PNVTs and recorded over the last 20 years (see aerial photo analysis and Anderson Mesa Landscape Scale Assessment Vegetation Group Specialist Report, Forest Service 2004a) which may result in increased evapotranspiration and decreased runoff and water yield.

Table 4 shows which connected waters (drainages that connect to perennial streams) and which 5th and 6th code watersheds are associated with recommended wilderness. This was used during the analysis of how recommended wilderness impacts water quality.

Table 4. Recommended wilderness areas and acres of connected waters

Area	Alt. C	Alt. C	Alts. B, C	Alt. C	Alt. C
Lower Likelihood That Wildfires Would be Suppressed					
	Barbershop (1,304 acres)	East Clear Creek (2,016 acres)	Davey's (1,779 acres)	Cimarron-Boulder (15,305 acres)	Hackberry (25,131 acres)
Acres recommended wilderness with connected waters (total = 45,535)	1,304	2,016	1,779	15,305	25,131
Connected waters	East Clear Creek, Barbershop	East Clear Creek, Yeager Canyon	Fossil Creek	Fossil Creek, Verde River	Fossil Creek, Verde River
Watershed- 6th code	Barbershop Canyon 6th	East Clear Creek 6th	Lower Fossil Creek 6th	Lower Fossil Creek 6th, Sycamore Canyon 6th	Lower Fossil Creek, Gap Creek -Verde River, Sycamore Canyon 6th codes
Watershed -5th code	Upper Clear Creek 5th	Upper Clear Creek 5th	Fossil Creek-Lower Verde River 5th	Fossil Creek-Lower Verde River 5th	Fossil Creek-Lower Verde River 5th
Moderate to Higher Likelihood That Wildfires Would be Suppressed					
	Black Mountain	Cedar Bench	Walker Mountain	Deadwood Draw	

[11] Output of water yield or water supply (used synonymously in this analysis) is the amount of water which leaves the immediate site to become surface water yield or groundwater recharge. Essentially, it is the difference between total precipitation and actual evapotranspiration.

Area	Alt. C	Alt. C	Alts. B, C	Alt. C	Alt. C
Acres recommended wilderness with connected waters (total = 33,676)	9,774	5,783	6,378	11,786	
Connected waters	West Clear Creek	West Clear Creek	Walker Creek, Wet Beaver Creek	Wet Beaver Creek	
Watershed- 6th code	Lower West Clear Creek 6th, Middle West Clear Creek 6th	Lower West Clear Creek 6th, Middle West Clear Creek 6th	Walker Creek 6th, Lower Wet Beaver Creek 6th	Upper Wet Beaver Creek 6th	
Watershed -5th code	West Clear Creek 5th	West Clear Creek 5th	Beaver Creek 5th	Beaver Creek 5th	

Riparian Resources (Riparian Forests, Wetlands, Streams, and Springs)

This section describes the methodology and analysis processes used to determine the environmental consequences on riparian resources including wetlands, streams, and springs from implementing the alternatives. Environmental consequences are not site-specific at the broad forest planning level and will be described with qualitative descriptions supported by past studies and observations. Much of the background information is found in the Ecological Sustainability Report and its supporting specialists' reports.

The Riparian Area Survey and Evaluation System (RASES) (USDA Forest Service 1989) is a site specific riparian area survey specific to the Coconino NF that inventoried stream (i.e., lotic) riparian areas on the forest. It offers the best spatial information of riparian area location, type, condition, and future potential for ecosystem diversity analysis at the forest planning level and below. Riparian vegetation condition was determined and summarized by 4th and 5th code HUC watersheds by the following PNVTs: Cottonwood Willow Riparian Forest, Mixed Broadleaf Deciduous Riparian Forest, Montane Willow Riparian Forest, Gallery Coniferous Riparian Forest, and Wetland/Cienega. The forest's GIS layer has been updated using RASES data and more recent Regional Riparian Mapping Project (RMAP) mapping. RASES uses a narrower geographical extent than RMAP, and therefore, interpolating these two data sources requires the assumption that the larger, regionally mapped area is proportionally in the same condition as the RASES on-site evaluation.

Since the mid-1990s, the forest has utilized Proper Functioning Condition (PFC) classification system (USDI Bureau of Land Management 1998 and 2003) to determine condition of riparian areas. The PFC inventory for the forest was derived from on-site evaluation collected from 1989 to 2007 on more than 95 percent of the known forest riparian areas. The PFC classification system is a consistent approach to determine how well physical processes are functioning. It is a qualitative assessment based on quantitative science.

PFC lotic (streams) and lentic (wetlands) classes are defined as follows:

- **Proper Functioning Condition** - Riparian and wetland areas are functioning properly when adequate vegetation, landform, or large woody debris is present to:
  - dissipate stream (water) energy associated with high flows, thereby reducing erosion and improving water quality;
  - filter sediment, capture bedload, and aid in floodplain development;
  - improve flood-water retention and ground-water recharge;
  - develop root masses that stabilize streambanks or edges of wetlands;
  - develop diverse ponding, channel, wetland, and cienega characteristics to provide for fish and waterfowl habitat, greater biodiversity, and other uses.
- **Functioning-at-risk (FAR) -** Riparian and wetland areas that are in functional condition, but an existing soil, water, or vegetation attribute makes them susceptible to degradation.
- **Non-functioning (NF) -** Riparian and wetland areas that clearly are not providing adequate vegetation, landform, or large woody debris to dissipate stream or water energy associated with high flows, and this are not reducing erosion or improving water quality.
- **Unknown -** Riparian and wetland areas for which there is insufficient information on to make any form of determination.

A qualitative estimate was made of the trend from reference to current riparian condition by reviewing forest data and projecting the estimated change in trend for upland and riparian vegetation condition (Forest Service, 2007). Current departures for riparian PNVTs were derived using methods similar to those used for PNVTs. Table 5 shows an example of departure values for PNVTs and table 6 and table 7 show the departures for riparian resources.

Table 5. Example of departure values for PNVTs

	State A	State B	States C, D	Sum
Successional Structure, Composition and Cover Class	Early development, open canopy	Mid development, young to mature trees, closed canopy	Late development, mature and old trees, open to closed canopy	
Reference percent composition	5	55	40	100
Current percent composition	9	28	63	100
Similarity value[1]	5	28	40	73

Departure value percent = 100 – 73 = 27; e.g., 100 – sum of simlarity values

[1] The Similarity Value = lower of Current or Reference values by class.

Table 6. Riparian Forest departure (total miles with data)

PNVT	Condition	Miles by PFC Class	Reference Percent	Current Percent	Similarity Value	Departure Value
Cottonwood Willow Riparian Forest (83 miles)	PFC	42.5	100	51	51	
	FAR	35.8	0	43	0	
	NF	4.7	0	6	0	
			100	100	51	49%
Mixed Broadleaf Deciduous Riparian Forest (117.3 miles)	PFC	86.5	100	74	74	
	FAR	30.8	0	26	0	
	NF	0	0	0	0	
			100	100		26%
Montane Willow Riparian Forest (262.9 miles)	PFC	189.7	100	72.15	72	
	FAR	57.8	0	21.98	0	
	NF	15.4	0	5.8	0	
			100	99.93		28%
Gallery Coniferous Riparian Forest (unknown)	PFC	Unknown	Assumed 100	Assumed 100	100	0%
	FAR	Unknown	0	0	0	
	NF	Unknown	0	0	0	

Table 7. Wetland departure (total number/total acres)

Condition	Total Wetlands/ Total Acres (73/9160)	Reference Percent	Current Percent	Similarity Value	Departure Value
PFC	43 wetlands/8,295 acres	100	59/91	59/91	
FAR	30 wetlands/865 acres	0	41/9	0	
NF	0	0	0	0	
		100	100		41%/9%

Assumptions for Riparian Resources

In the analysis for riparian resources, additional assumptions have been made:

- Riparian functional condition for all known riparian areas was mapped as linear segments (or stream reaches) using the forest's RASES stream GIS layer as a base and assigning

Proper Functioning Condition (PFC) attributes to each stream reach. This information was derived from actual PFC surveys (inventoried).

- Recent additions to the Riparian PNVT GIS layer, from more accurate riparian mapping, include a new PNVT called the Gallery Coniferous Riparian Forest and also several cienegas associated with the Wetland/Cienega PNVT. No riparian condition information has been collected in these areas. For this analysis, we assumed livestock grazing and recreation related impacts were low because locations of Gallery Coniferous Riparian Forest are largely inaccessible or associated with steep drainages, and therefore have a low departure and are in proper functioning condition. In contrast, cienegas are accessible to livestock and recreationists so we assumed they were highly departed. We assumed both of these types were in proper functioning condition under reference conditions because livestock grazing would have been absent and people use would have been low.

Assumptions for Wetland/Cienegas and Springs

In the analysis for Wetland/Cienega and springs, additional assumptions have been made:

- Impacts from humans in reference conditions were neither widespread nor frequent; consequently these water features were in proper functioning condition.
- Most springs that are accessible and unfenced are not in proper functioning condition due to recreation impacts or excessive use from permitted livestock or wildlife.

Biophysical Features

Caves, Cliffs, Sink Holes, Lava Tubes, Fissures, and Talus Slopes

The analysis for these resources focuses on the consequences of managing the existing caves, cliffs, sink holes, lava tubes, fissures, and talus slopes on the forest; it also identifies management concerns. These features are generally described using information from available literature and from internal Forest Service documents. By law, cave information is confidential; information will not be disclosed that could be used to determine the location of caves on the forest except for the one designated recreational cave, the Lava River Cave. The names of caves designated as significant or potentially significant will not be disclosed because this could provide location information. For the analysis, the Plan alternatives were compared based on how they would protect and preserve the geologic and biophysical features and conserve the scientific values of these resources; therefore, this was a qualitative analysis.

Assumptions for Caves, Cliffs, and Talus Slopes

In the analysis for caves, cliffs, sinkholes, lava tubes, fissures, and talus slopes, additional assumptions have been made:

- The forest will follow the significant cave nomination process, complete annual reporting of cave management activities, and may nominate more caves as significant in the future by the forest supervisor.

Paleontological Resources

The analysis focuses on the consequences of managing the existing known and potential (i.e. unknown) paleontological resources on the forest. Paleontological resources are generally

described using information from available literature and from external agency information mainly found on the Department of the Interior's websites containing geologic resource information for Tuzigoot, Montezuma Castle and Well, Walnut Canyon, Sunset Crater, and Wupatki National Monuments[12]. By law, paleontological resource information is confidential for vertebrate fossils; thus, information will not be disclosed that could be used to determine the location of fossil localities on the forest. Management concerns with paleontological resources are also identified.

Assumptions for Paleontological Resources

In the analysis for paleontological resources, the additional assumptions were made:

- The alternatives were compared on the basis of how they would protect and preserve paleontological resources and conserve the scientific values of the areas.
- This was a qualitative analysis.

Soil

The analysis describes the current soil condition, productivity departures (historic to current), and projected trends in soil condition by alternative. It also describes the potential effects associated with management activities that could affect soil condition.

The forest soils are described in the "Terrestrial Ecosystem Survey of the Coconino NF" (USDA Forest Service 1995c). The terrestrial ecosystem survey is the result of a systematic analysis, mapping, classification, and interpretation of terrestrial ecosystems (also known as ecological types) which are delineated and numbered in ecological units. It is the only seamless mapping of vegetation and soils available across the forest that identifies sites that have been field visited, validated, and correlated according to stringent regional and national protocol and stems from years of work. Major fieldwork was completed from 1987 to 1991. Soil names and descriptions were approved in 1992.

Soil condition is based on the primary functions of soil hydrology, soil stability, and nutrient cycling as described by Southwestern Region Supplement Forest Service Handbook 2509.18. The current soil condition rating is described in the "Ecological Sustainability Report" and was based on how departed soils are from the historic range of natural variability.

Soil productivity is a combination of soil organic matter, litter cover, and estimated understory and forage production. Information from the terrestrial ecosystem survey was used to establish reference conditions for forage and litter production and current litter cover. It was also used to describe reference condition values and current values for understory and forage production, which were estimated from field observations made forestwide (USDA Forest Service, 2007). Organic matter thickness was derived from thickness of the organic surface horizon through soil classification (USDA Forest Service 2009a).

[12] http://www.nature.nps.gov/geology/inventory/gre_publications.cfm

Departures levels in soil condition and productivity were identified as low, moderate, or high. These estimates compared historic and current soil conditions (e.g., erosion, compaction, organic matter, litter cover, understory forage) based on acreage differences between current and historic soil condition by PNVT. Percent soils in satisfactory condition under reference conditions is the estimated amount of satisfactory soil conditions before human activities had major influences and disturbances on soil condition (i.e., pre-European settlement), and it is based on correlated Terrestrial Ecosystem Survey ecological reference sites.

No models currently exist to predict trends and future foreseeable conditions for soil resources, in particular, soil condition, soil productivity, or soil organic matter. However, qualitative inferences can be made and estimated which provide insight into future soil conditions primarily by using knowledge about present disturbances and their effect on erosion processes, soil compaction, and nutrient cycling. Tables have been prepared to generally estimate trends and conditions using existing data and current conditions, combined with projected future vegetation conditions derived from the Forest's Vegetation Dynamic Develop Tool (VDDT) models[13]. Dominant vegetation and tree density and canopy cover has an effect on ground cover conditions. Where mechanical treatments are proposed, herbaceous understory would improve along with soil condition. Therefore, predicted improvements in soil condition from implementing treatments modeled by VDDT are made. Each table highlights combinations of current departure (i.e., low, moderate, and high) from reference conditions for soil condition and productivity which includes soil organic matter, vegetative ground vegetation and plant composition and biomass productivity. Inferences of future conditions and trend were made based on current knowledge of how canopy cover (and ecological state) presently affects these key soil components.

Projected trends in soil condition and soil productivity were based on estimates of the relative change in soil erosion, soil compaction, and soil nutrient cycling by alternative. These estimates use vegetative ground cover and herbaceous understory as indicators to determine the change in soil condition and productivity.

Each PNVT was examined to see whether soil conditions would generally trend towards, away, or remain static with the implementation of treatments by alternative. The analysis supports the VDDT modeling results for each vegetation type.

Microbiotic (i.e., biological) soil crusts have not been quantified in any detail. However, a qualitative summary may be useful in describing existing conditions and the ecological role of crusts in disturbed ecosystems. Since current composition and density of crusts have not be inventoried, trends can only be inferred based on current and projected management impacts that have been shown in research to alter populations of crusts.

Because management activities that would occur under any plan alternative are estimates, the effects analysis is useful in comparing and evaluating alternatives on a forestwide basis but should not be applied to specific locations on the forest. Resources not within the forest's ability to control were noted.

[13] The VDDT models predict overall dominant vegetation condition and trends, and they describe relative amounts of each PNVT in the defined ecological states in the future.

Assumptions for Soil

In the analysis for soil, an additional assumption was made:

- Historically, most areas on the forest (89 percent) are inferred to have been in satisfactory[14] soil condition and about 11 percent of the areas were inherently unstable.[15]

Vegetation and Fire

The vegetation analysis modeled the potential vegetation conditions resulting from natural disturbances and succession in conjunction with proposed management (human disturbances) for each of the alternatives. The evaluation focused on ecosystem functions associated with the priority needs for change in the "Analysis of the Management Situation" (USDA Forest Service 2010a) and served as the basis for several other resource assessments including species habitats, soil and watershed condition, air quality, and social and economic uses. A number of sources were used to display current conditions. Various models were used to predict trends in vegetation and disturbances in response to natural and anthropogenic forces by alternative. Alternatives were evaluated by their progress toward priority needs for change and associated desired conditions.

Vegetation Modeling

State-and-Transitions Models (STMs) played a prominent role in the plan revision process in the Southwestern Region. The State-and-Transitions model used for plan revision analysis was the Vegetation Dynamic Development Tool or VDDT. In the first phase of the process, the VDDT was used in the ESR to estimate condition and trends of some of the PNVTs and to identify ecological needs for change. Following this, priority needs for change to be addressed in plan revision were identified in the "Analysis of the Management Situation." In the analysis for the draft environmental impact statement, outputs from the VDDT models were used to compare the conditions and trends of PNVTs by alternative. VDDT models are further described below.

Several sources were utilized to determine existing conditions.

The primary sources for existing vegetation conditions included:

- Information about the frequency of stand-replacing fire on the Coconino NF and other national forests located along the Mogollon Rim in northern Arizona.
- A classification of PNVTs developed and based primarily upon the map units from the Terrestrial Ecosystem Survey. This classification was used to compare existing vegetation to characteristic vegetation[16]. Descriptions of PNVTs with characteristic vegetation composition and structure for the Coconino NF were displayed in a spreadsheet.
- A mid-scale vegetation inventory. This inventory, completed in 2008 for the Coconino and Kaibab National Forests, provided geospatial polygons of life form characteristics

[14] Satisfactory: soil function is being sustained and soil is functioning properly and normally.

[15] Inherently unstable: soils are naturally eroding faster than they are renewing and are functioning normally.

[16] Characteristic vegetation is the vegetation composition and structure that would exist in a natural disturbance regime, and considered to be ecologically sustainable, and more resilient to climate change.

(e.g., tree, shrub, and grass-forb), size class (for trees), and canopy cover class. The Southwestern Regional Office performed an accuracy assessment of the mid-scale vegetation inventory for the Coconino and Kaibab National Forests, and estimated the average accuracy (weighted by area) at 61percent for species dominance (68 percent for "tree classes"), 59 percent for canopy cover class, and 42 percent for size class (USDA Forest Service 2008a). This data is a mid-scale product meant to represent general landscape vegetation patterns that are being evaluated with base scale plots (i.e., comparing mid-scale data points to Forest Inventory and Analysis data points), and it is not appropriate for site-specific analyses (Mellin 2011). However, this data is appropriate for use in landscape-scale projects such as plan revision.

- Forest Inventory and Analysis (FIA) plot data. The FIA plot data was used to: estimate relative proportions of even- and uneven-aged structural conditions on the forest, estimate proportions of various vegetation types within piñon juniper systems, estimate the amount (percentage) of ponderosa pine-Gambel oak vegetation on the forest, estimate the quantity of snags in ponderosa pine, and calibrate the VDDT model used in predicting vegetative trends (USDA Forest Service 2011f).

Various models were then used to predict trends in vegetation and disturbances in response to natural and human forces by alternative. VDDT was the primary model used to evaluate trends. VDDT is a Windows-based computer tool which provides a modeling framework for examining the role of various disturbance agents (e.g. fires, insects, pathogens) and management actions in vegetation change. The interaction of these disturbances is complex, and the combined effects are difficult to predict over long periods. VDDT provides a way to compare alternatives by testing the sensitivity of the ecosystem to a multitude of activities and agents of disturbance. Using the VDDT model, a vegetation type is assigned various states—some are seral states found within the historic range of variability and others are uncharacteristic states not present in the historic range of variability. Inputs to the VDDT model are agents of disturbance, such as number of acres mechanically treated to restore vegetation stand structure or acres that are burned by fire under low, moderate, or high fire weather conditions. Outputs to the VDDT model are the transition of the vegetation, by percent, from one state to another. For example, an input of high severity fire would move a percentage of dense states to more open states. Conceptual diagrams projecting transitions in vegetation states (i.e., composition and structure) can be found in Figure C- 1 and Figure C- 2. State descriptions are listed in table 8 below.

Table 8. VDDT state descriptions

State	Description
A	Grass, forb, shrubland; <10% canopy cover
B	Seeding/sapling, open; <10% canopy cover
C	Small trees, open; 10-30% canopy cover; 5-10” diameter class
D	Medium trees, open, single story; 10-30% canopy cover; 10-20” diameter class
E	Very large trees, open, single story; 10-30% canopy cover; 20+” diameter class
F	Seeding/sapling, closed; >30% canopy closure; 0-5” diameter class
G	Small trees, closed; >30% canopy closure; 5-10” diameter class
H	Medium trees, closed, single-story; >30% canopy closure; 10-20” diameter class
I	Very large trees, closed, single-story; >30% canopy closure; 20+” diameter class
J	Medium trees, open, multi-story; 10-30% canopy closure; 10-20” diameter class
K	Very large trees, open, multi-story; 10-30% canopy closure; 20+” diameter class
L	Medium trees, closed, multi-story; >30% canopy closure; 10-20” diameter class
M	Very large trees, closed, multi-story; >30% canopy closure; 20+” diameter class
N	Uncharacteristic state ; <10% canopy cover

Projecting transitions in vegetation states (i.e., composition and structure) over time facilitates the evaluation of each alternative considered. The vegetation states, and transitions from one state to another, can be visualized in a conceptual diagram. Figure C- 1 below illustrates the conceptual diagram for the successional pathways of the Ponderosa Pine Bunchgrass PNVT state-and-transition model. Boxes represent model states and arrows represent transitions due to natural growth and other natural and human factors such as management activities, fires, insects, and disease.

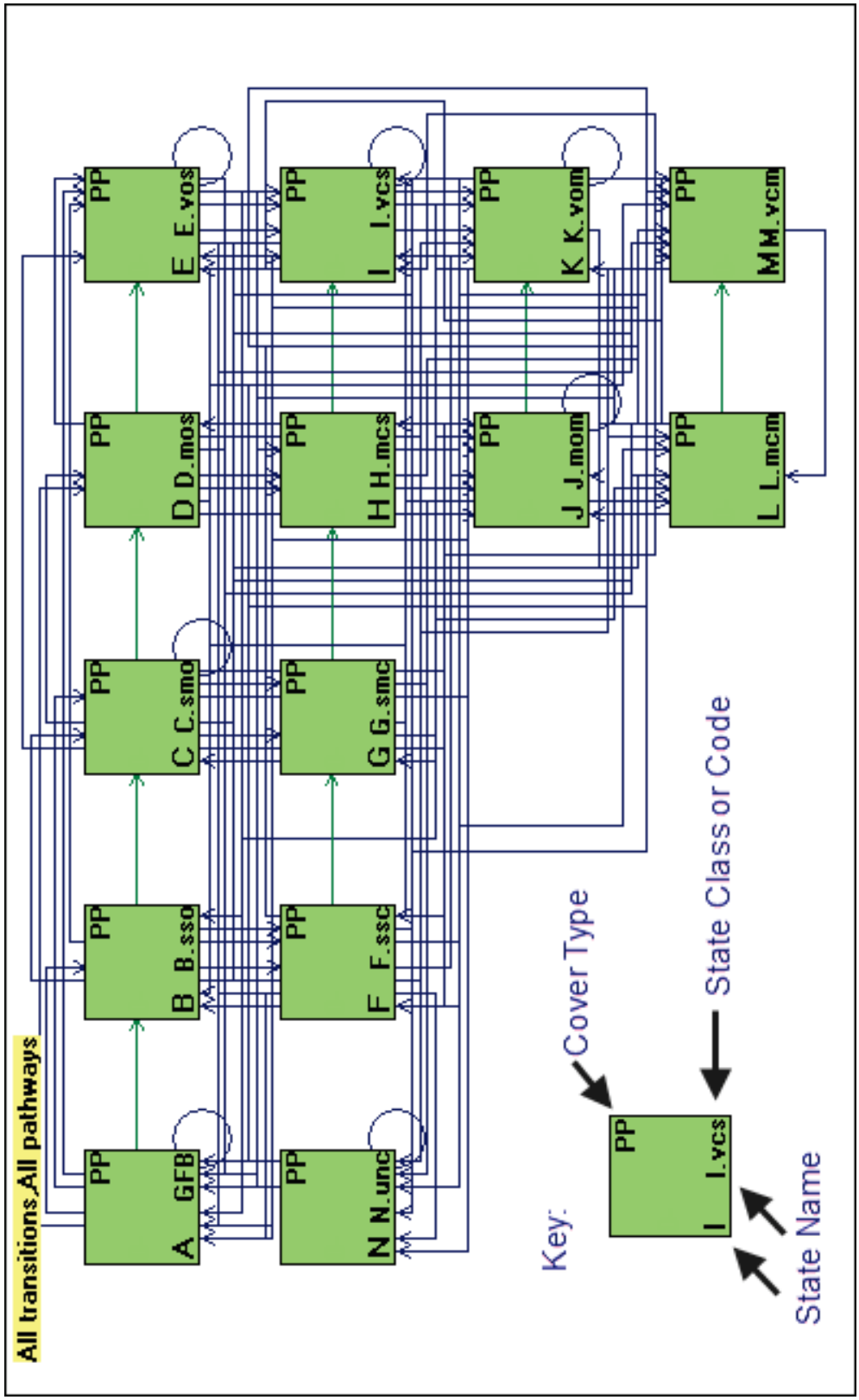

Figure C- 1. VDDT conceptual diagram for projecting transitions in vegetation states

Figure C- 2 is a conceptual diagram for the historic state and transition model of the Semidesert Grassland Mixed Native Vegetation PNVT. Frequency of transitions are noted when this information is supported by published sources, where no information exists on the frequency of transitions the arrow is blank. Dashed outlines represent states which have crossed an ecological threshold. An example of ecological threshold is the box labeled "eroded condition" in Figure C-2 below.

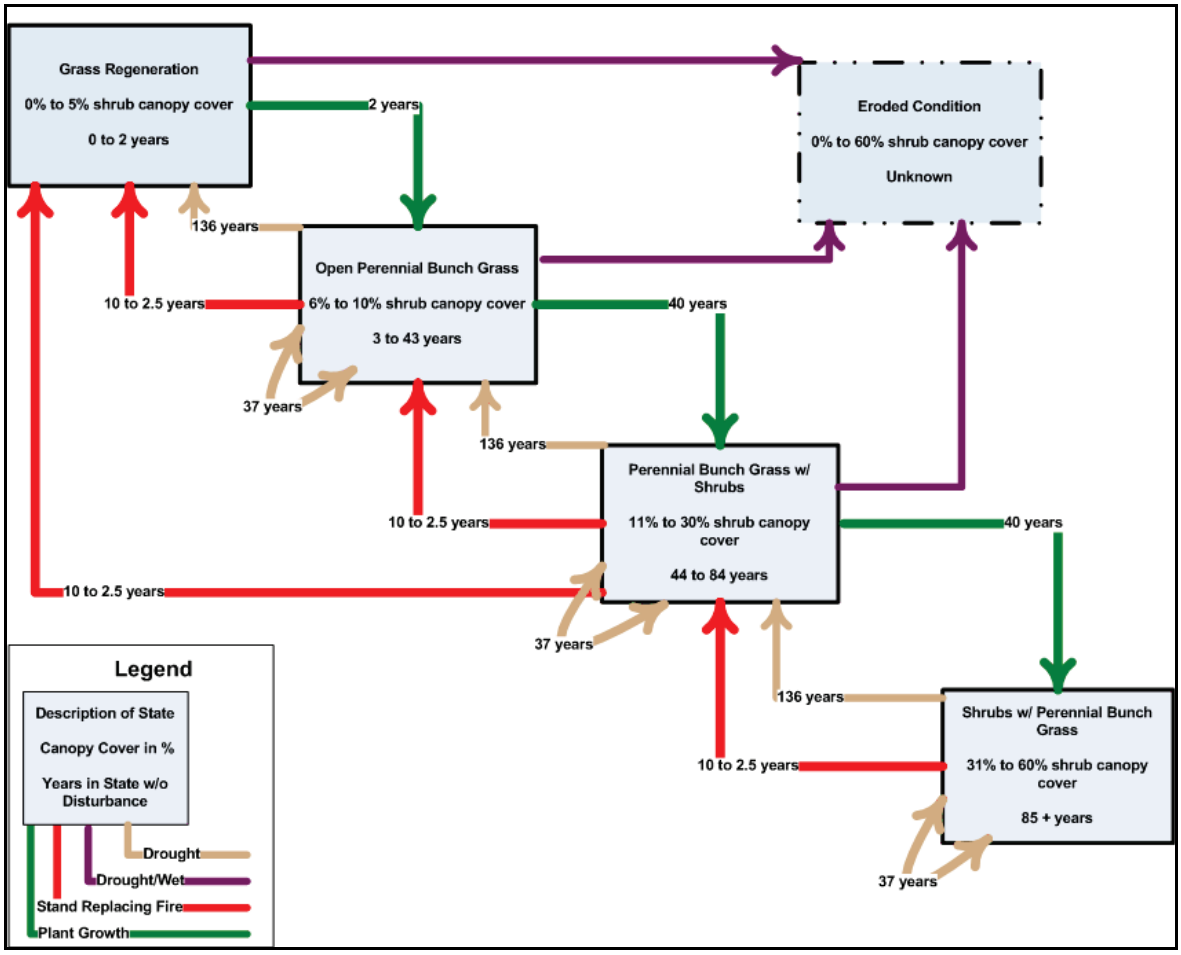

Figure C- 2. Conceptual historic State and Transition Model for the Semidesert Grassland Mixed Native Vegetation Type

VDDT models for ponderosa pine, mixed conifer, and piñon juniper vegetation types (among others) were developed by the Forest Service at the regional level to be used specifically to compare alternatives for land management plans in the Southwestern Region. The actual data, databases, and spreadsheets that were used in this process are contained in the forest plan revision project record.

The Forest Vegetation Simulator (FVS) was used to calibrate STMs in Arizona and New Mexico. A standard set of silvicultural and fire transitions were evaluated using FVS simulations of Forest Inventory and Analysis plot data that have been grouped up by each Vegetation Dynamic

Development Tool (VDDT) model state within each Potential Natural Vegetation Type (PNVT). For example, if a stand that is in the medium-sized, closed canopy, single story state were treated with group selection and free thinning followed by low severity Rx fire, it may go from 100 percent in the closed canopy, single story state to 20 percent grass/forb/shrub; 5 percent very large, open, single story; 50 percent medium, open, single story; and 25 percent remaining in the original closed canopy, single story state. A range of outputs from FVS (e.g., natural growth in the absence of disturbance, the probabilities of transitions to destination states resulting from natural and human events, harvest volumes, and vegetation characteristics such as carbon values) were captured and linked to transitions through the modeling framework. These outputs were used to evaluate the effects of vegetation management activities in the plan revision process (USDA Forest Service 2011h)

The forest began with the models for Ponderosa Pine Bunchgrass (PPG) and Mixed Conifer with Frequent Fire (i.e. Mixed Conifer Dry or MCD) models. The PPG model was similar enough to the Ponderosa Pine Gambel-Oak (PPO) model that the two were evaluated together as Ponderosa Pine Forest (PPF). A spreadsheet displaying a crosswalk of the PNVTs and VDDT models is contained in the project record and it allows for user input of the percentage of PPG and PPO. Using FIA data collected across the forest over the past 10 years, it was estimated that PPO accounts for approximately 40 percent of the combined PPF type (Manthei 2011). The VDDT model provided a base comparison for the relative progress the plan alternatives are predicted to make toward desired conditions based on plan objectives. Much of the modeling response in VDDT was calibrated using FIA data inputs and results from FVS runs. In contrast to VDDT models, FVS can be more sensitive to management, because it models the fate of individual trees over time rather than finite states of stand averages.

Each ecosystem has a standard set of vegetation states. Each vegetation state has a typical set of vegetation characteristics whose attributes can be defined by the FIA inventory plots that reside within the state (Miles et al. 2001). A standard set of potential natural and human events can occur within each state. These states and the effects of each event can be modeled with FVS simulations using the FIA plot data (Dixon 2002). Reports generated from FVS outputs can provide a variety of information by quantifying the following information by VDDT model state:

- The vegetation characteristics of each vegetation state.
- The probabilities of transitions to destination states resulting from:
    - natural growth in the absence of disturbance,
    - management activities, and
    - wildfire.
- The wood volumes and other outcomes resulting from each type of disturbance.

In the analysis process, the vegetation characteristics existing at any point in time for each modeled PNVT are described by specific combinations of size, cover, and dominance type that are characteristic for each PNVT. For example, the combinations used to describe the vegetation

states in the Ponderosa Pine Grassland ecosystem are illustrated in table 9 (Weisz et al. 2011)[17]. GFB-SHR stands for Grass Forb-Shrub.

Table 9. Stratification of Ponderosa Pine and Mixed Conifer with Frequent Fire states A through N

Canopy Layering	Canopy Cover[1]	GFB-SHR	Tree DBH			
			0-5"	5-10"	10-20"	20"+
Single	Open	A or N[2]	B	C	D	E
Single	Closed		F	G	H	I
Multi	Open				J[3]	K[3]
Multi	Closed				L	M

[1] Except for states A and N, "open" states have 10 to 30 percent canopy cover and "closed" states have greater than 30 percent canopy cover. States A and N have less than 10 percent canopy cover.
[2] States A and N are grass, forbs, brush and shrub states. A is the characteristic state which existed in reference conditions. N is the uncharacteristic state resulting when stand-replacing fire occurs in closed canopy states.
[3] The desired condition is an open multi-layered ($\geq$ 5 age classes) state with average diameter varying by site productivity, state J occurring on less productive sites and state K on-sites with greater productivity.

The Forest Vegetation Simulator (FVS) (v2.02) along with the Fire and Fuels Extension (FFE) were used to simulate the effects of using fire as a restoration tool on various stand conditions. Only one fire cycle per stand was modeled, but each fire was modeled at low, moderate and high intensities. The comparative stand conditions from pre-modeled fire to post-modeled fire were then used as input to the Vegetation Dynamics Development Tool (VDDT). VDDT was used to model vegetation succession over the life of the forest plan and into the future, under the various proposed management alternatives. The current plan describes goshawk habitat in terms of Vegetation Structural Stage or VSS classes. Table 10 provides a crosswalk between VDDT model states, VSS class, and descriptions of northern goshawk habitat from Reynolds and others (Reynolds et al. 1992). Table 10 through Table 19 provide crosswalks between the state names used in the DEIS analysis and the more descriptive, qualitative state descriptors used in the analysis of alternatives along with proportions of each stated under reference (desired) conditions. These tables are located after the vegetation modeling assumptions.

Environmental conditions used to simulate the low, moderate, and high fire conditions are based on historic weather data from the Alpine Remote Automated Weather Station (RAWS). The Alpine RAWS has complete and accurate weather data. The data were sorted using Fire Family Plus (v4.1) to produce a Percentile Weather Report. This percentile report was used to determine the 15th, 75th and 90th percentile weather for the past twenty years (1990 to 2009). Weather data were used for a period from April 1 to October 15 each year, representing a typical fire season period. The 15th percentile represents natural fire season conditions for a low intensity fire and the 75th percentile represents moderate and the 90th percentile the high intensity fire conditions.

[17] A more detailed explanation can be found in the manuscript Calibrating State and Transition Models with FVS: A Case Study (Weisz et al. 2011).

These percentiles of environmental conditions were used to represent both wildfires as well as prescribed fires. These environmental conditions approximate natural conditions under which a natural fire may burn and would be a good starting point for development of a management burning prescription. Winds generated from the report were unusually low, so 10, 15 and 20 mph winds were substituted for low, moderate, and high 20 mph winds. The percentile weather report does not produce an air temperature, so based on analysis of the weather data and professional judgment 60, 75, and 90 degrees were used respectively. Duff moisture is also not produced by the percentile weather report. These were derived using FVS, FFE defaults for duff moisture under moist 125 percent, dry 50 percent, and very dry 15 percent conditions (USDA Forest Service 2008c p. 43). Varying duff moisture had little effect in the model on fire effects on stand conditions. These conditions were used across all vegetation types to provide consistency. A cooler and moister condition at higher elevation vegetation types compared to hotter and dryer lower elevation vegetation types was not significant in model outcome.

Assumptions for Vegetation and Fire

In the analysis for vegetation and fire, additional assumptions have been made:

- There are minor, acceptable inconsistencies between the number of acres on the forest between the Coconino NF administrative boundary and the PNVT GIS data layer.
- Ponderosa Pine PNVT was not broken out into a subsection of Gambel-oak. In the calculations of desired conditions using the PNVT to VDDT crosswalk, FIA data was used to calculate that ponderosa pine-Gambel oak accounts for approximately 40 percent of the Ponderosa Pine PNVT on the forest.
- Desired conditions for Ponderosa Pine Forest and Mixed Conifer with Frequent Fire are most heavily represented by the combination of transitional states D, E, J, and K, with the majority being in states J and K. The important distinction is that states J and K are both multi-storied (i.e., uneven-aged) and have at least three age classes represented, including adequate openings for planned regeneration immediately after treatment. Although a state is described as “medium” or “very large” trees, it is inferred that trees of other sizes/ages are included. For example, state J is dominated by trees of 10 to 20 inch diameter at breast height (DBH), but it would also include a more or less balanced representation of seedlings/saplings, small trees, and very large trees (DBH of 20 inches or higher) as well because it represents a multi-storied, uneven-aged state. Similarly, state I contains primarily very large trees and is described as single-storied (i.e., even-aged) with closed canopy, but it may also contain up to one other distinct size/age class and scattered single trees of different sizes.
- The occurrence interval of 35 years for mixed severity fire was used for modeling Great Basin Grassland and Montane Sub-alpine Grassland PNVTs. Mechanical clearing was then added at the low and high objectives for these PNVTs. Tree encroachment as a consequence of missed fire return intervals has resulted in departure from historical open states. We assumed that mixed severity fire would be the initial type of fire because of the tree encroachment and that a 35 year fire return interval would be appropriate because these frequent fire systems have not experienced frequent fire.
- Modeling for Alternative A (the 1987 plan) assumes that uneven-aged silvicultural systems (e.g., group selection) would be the predominant system(s) used; thus, the VDDT projects the modeled PNVTs to improve over current conditions with alternative A.

- Alternatives were modeled out 15 years and 50 years. The 15-year time period is designed to represent the life of the revised plan, and the 50-year time period is designed to demonstrate longer term trends. As with any predictive model, it should be assumed that accuracy may decline the farther out in time that a given simulation is projected because of the chaotic nature of the system(s) being modeled.
- The Federal Fire Policy Implementation Guidance continues to provide clear direction regarding the use of wildland fire (USDA and USDI, 2008c).
- Acres treated, from both mechanical and fire treatments, that improve (or reduce) departure from desired conditions are considered effective because they alter forest structure (e.g., tree density, crown base heights, and fuel load and arrangement) enough to make these acres fire-resilient for 5 to 10 years.
- A set acreage would be burned each year and varies by alternative. The actual acres burned may fluctuate yearly due to the number, timing, and location of wildfire starts; NEPA analysis completed; availability of fire resources; weather conditions; fuel conditions; and smoke management and socio-political factors (e.g., burn bans or fire restrictions). Updates in Federal fire policy may also influence actual acres burned. The number of acres burned are dependent on many variables, few of which are within the forest's direct control.
- Plan objectives are achievable considering budgets, market conditions, project planning timelines, and external factors (e.g., weather conditions and fuel conditions) over the next 10 years and there are no major changes in policy or other factors.
- Ninety-five percent of annual prescribed fire treatments are in the Ponderosa Pine PNVT, and five percent are in the Mixed Conifer with Frequent Fire PNVT.
- The maximum number of acres burned using prescribed fire is about 30,000 acres per year and would only be possible under the Four-Forest Restoration Initiative or other large scale restoration project.
- Wildfires with resource objectives would be utilized aggressively, under the assumption that on average 15,000 acres are burned each year (range of 5,000 to 50,000 acres) in the following PNVTs: 90 percent in Ponderosa Pine, 5 percent in Mixed Conifer with Frequent Fire, 2.5 percent in Piñon-Juniper Grasslands, and 2.5 percent in Piñon-Juniper Evergreen Shrub. Ponderosa Pine, Mixed Conifer with Frequent Fire, and Piñon-Juniper Grasslands would be managed under low severity fire; while Piñon-Juniper Evergreen Shrub would be managed under mixed severity fire. These acreage assumptions are based on past and predicted opportunities and consider fuel conditions, smoke management factors, firefighting capability, leadership and resource availability, and fire policy.
- Low severity fires refer to an area where a relatively uniform fuel type results in 0 to 25 percent top-kill of vegetation when burned, and mixed severity fires refer to an area where a relatively uniform fuel type results in 25 to 75 percent top-kill of vegetation when burned.[18]

[18] Low severity fires cause less than 25 percent average replacement of dominant overstory above ground biomass within a typical fire perimeter; while mixed severity fires cause between 25 and 75 percent. See LANDFIRE website: http://www.landfire.gov/NationalProductDescriptions14.php

- Based on FIA plots, we assumed that 60 percent of the Ponderosa Pine PNVT was the ponderosa pine/ bunchgrass sub-type and 40 percent was the ponderosa pine/Gambel oak subtype.

Table 10. Crosswalk between model states for Ponderosa Pine Forest and the Mixed Conifer with Frequent Fire PNVTs and vegetative structural stages in the 1987 plan

Name	Code	Description	Tree Size Class Break in Inches	Story	Tree-Shrub Canopy Cover percent	Approx. VSS	RM-217 Descrip-tion
A	GFB/ SHR	Grass, Forb, Brush/Shrub	NA	NA	0 - 10	VSS1	<1" dbh Grass, Forb, Shrub (opening)
B	SSO	Seedling, Sapling, Open	0 – 5	Single	10 - 30	VSS2	1-4.9" dbh Seedling, sapling
C	SMO	Small, Open	5 – 10	Single	10 - 30	VSS3	5-11.9" dbh Young Forest
D	MOS	Medium, Open, Single story	10 – 20	Single	10 - 30	VSS4	12-17.9" dbh Mid-age Forest
E	VOS	Very-large, Open, Single story	20 plus	Single	10 - 30	VSS5&6	18"+ dbh Mature and Old Forest
F	SSC	Seedling, Sapling, Closed	0 – 5	Single	30 plus	VSS2	1-4.9" dbh Seedling, sapling
G	SMC	Small, Closed	5 – 10	Single	30 plus	VSS3	5-11.9" dbh Young Forest
H	MCS	Medium, Closed, Single story	10 – 20	Single	30 plus	VSS4	12-17.9" dbh Mid-age Forest
I	VCS	Very-large, Closed, Single story	20 plus	Single	30 plus	VSS5&6	18"+ dbh Mature and Old Forest
J	MOM	Medium, Open, Multiple story and Uneven Aged	10 – 20	Multiple story and uneven aged	10 - 30	VSS4	12-17.9" dbh Mid-age Forest
K	VOM	Very-large, Open, Multiple story and uneven aged	20 plus	Multiple story and uneven aged	10 - 30	VSS5&6	18"+ dbh Mature and Old Forest

Name	Code	Description	Tree Size Class Break in Inches	Story	Tree-Shrub Canopy Cover percent	Approx. VSS	RM-217 Descrip-tion
L	MCM	Medium, Closed Multiple story	10 – 20	Multiple story and uneven aged	30 plus	VSS4	12-17.9" dbh Mid-age Forest
M	VCM	Very-large, Closed, Multiple story	20 plus	Multiple story and uneven aged	30 plus	VSS5&6	18"+ dbh Mature and Old Forest
N	GFB/ SHR	Grass, Forb, Brush/Shrub	N/A	N/A	0 - 10	VSS1	<1" dbh Grass, Forb, Shrub (opening)

Table 11. Crosswalk between VDDT states and qualitative state descriptions used in alternative analysis for the Interior Chaparral PNVT

State (VDDT Model)	State (Qualitative)	Reference Percent Composition	Description, Size, and Cover Class
A	Early: grass, forb	2%	Recently burned, sparsely vegetated, and all corresponding herb types
B	Early-mid: grass, shrub	5%	Grass and Shrub-Open All corresponding shrub types
C, D	Mid-Late: dense shrub, no understory	93%	Dense shrub-closed AND all tree size and cover classes

Table 12. Crosswalk between VDDT states and qualitative state descriptions used in alternative analysis for the Semidesert Grassland PNVT

State (VDDT Model)	State (Qualitative)	Reference Percemt
A	Grass forb regeneration	24%
B	Open perennial bunchgrass	76%
C	Perennial bunchgrass w/shrubs and trees, open canopy	0
D	Shrubs and trees w/perennial bunchgrasses	0

Table 13: Crosswalk between VDDT states and qualitative state descriptions used in alternative analysis for the Great Basin Grassland PNVT

State (VDDT Model)	State (Qualitative)	Reference Percent
A	Early development – recently burned, sparsely vegetated, open canopy	5
B	Mid development – grass, forbs, open canopy	70
C	Late development – open; some shrubs, seedlings and saplings and some mid-size trees	20
D	Mid development – some very large shrubs, closed canopy and some very large trees, open canopy	5

Table 14. Crosswalk between VDDT states and qualitative state descriptions used in alternative analysis for the Montane Subalpine Grassland PNVT

State (VDDT Model)	State (Qualitative)	Reference Percent
A	Early development, open canopy (herbaceous vegetation)	20
B/C	Mid development, open canopy (herbaceous vegetation)	80
D	Late development, closed canopy (trees, shrubs and herbaceous vegetation)	0

Table 15. Crosswalk between VDDT states and qualitative state descriptions used in alternative analysis for the Piñon Juniper PNVTs

State (VDDT model)	State (Qualitative)	Reference Percent PJ Evergreen Shrub	Reference Percent PJ Woodland (Persistent)	Reference Percent PJ with Grass	Size and Cover Class
A	Early Development	5%	10%	5%	Recently burned, grass, forb, and shrub types
B, E, C	Mid-Open	55%	5%	25%	Seed/sap-open Seed/sap-closed Small-open
D	Late-Open	40%	10%	50%	Medium-open, very large-open
F	Mid-Closed	0%	15%	10%	Small-closed
G	Late-Closed	0%	60%	10%	Medium-closed, very large-closed

Table 16. Crosswalk between VDDT states and qualitative state descriptions used in alternative analysis for the Ponderosa Pine PNVT

State (VDDT Model)	State (Qualitative)	Reference Percent	Description, Size and Cover Class
A, N	Early Development	0%	Recently burned, grass, forb, and shrub types
B, F	Early forest	1.4%	**Seed/sap-open** **Seed/sap-closed** Conditions indicative of occasional even-aged stand dynamics and the development of closed mature forest habitat. >10 percent tree cover
C	Young forest	1.4%	**Small-open** Conditions indicative of occasional even-aged stand dynamics and the development of closed mature forest habitat. <30 percent cover
D, J, E, K	Mid-age forest, Mature/old forest w/ regeneration,	88%	**Medium-open** (even and uneven-aged) **Very Large-open** (even and uneven-aged) Based on reference condition, and the predominance of uneven-aged dynamics and open forest. The plurality of stands on low-productivity sites likely to occur as Medium-open/uneven-aged, versus high-productivity sites where Very large-open/uneven-aged is more likely. <30% cover
G	Young forest,	1.4%	**Small-closed** Conditions indicative of occasional even-aged stand dynamics and the development of closed mature forest habitat. >30 percent cover.
H, L, I, N	Mid-age forest, Mature/old forest w/ regeneration,	7.8%	**Medium-closed** (even and uneven-aged) **Very Large-closed** (even and uneven-aged) Conditions indicative of mature closed forest habitat and occasional even-aged dynamics that occurred in the reference condition (Romme et al., 2010), particularly on north facing slopes and canyons. The plurality of stands on low-productivity sites likely to occur as Medium-closed, versus high-productivity sites where Very large-closed is more likely. >30 percent cover.

Table 17. Crosswalk between VDDT states and qualitative state descriptions used in alternative analysis for Mixed Conifer with Frequent Fire PNVT

State (VDDT Model)	State (Qualitative)	Reference Percent	Description, Size and Cover Class
A,N, B, F	Early Development, all structures	9%	**Seed/sap-open** **Seed/sap-closed** Recently burned, grass, forb, and shrub types, and conditions indicative of even-aged stand dynamics and the development of MSO habitat.
C	Mid development, open	3%	**Small-open** Reference condition, and conditions indicative of even-aged stand dynamics and the development of MSO habitat.
D, J, E, K	Late development, open	60%	**Medium-open** (even and uneven-aged) **Very Large-open** (even and uneven-aged) Based on reference condition, and the predominance of uneven-aged dynamics and open forest. The plurality of stands on low-productivity sites likely to occur as Medium-open/uneven-aged, versus high-productivity sites where Very large-open/uneven-aged is more likely.
G	Mid development, closed	3%	**Small-closed** Reference condition, and conditions indicative of even-aged stand dynamics and the development of MSO habitat.
H, L, I, N	Late development, closed	25%	**Medium-closed** (even and uneven-aged) **Very Large-closed** (even and uneven-aged) Conditions indicative of mature closed forest habitat and occasional even-aged dynamics that occurred in the reference condition (Romme et al. 2010), particularly on north facing slopes and canyons. The plurality of stands on low-productivity sites likely to occur as Medium-closed, versus high-productivity sites where Very large-closed is more likely.

Table 18. Crosswalk between VDDT states and qualitative state descriptions used in alternative analysis for the Mixed Conifer with Aspen PNVT

State (VDDT Model)	State (Qualitative)	Reference Percent	Description, Size and Cover Class
A	Early Development	7%	Recently burned, Grass/forb w/ aspen or oak ramets, 10-40 percent tree cover.
B	All aspen, and evergreen-deciduous mix tree types	21%	**Seed/sap, small, medium, and very-large - all cover classes.** Aspen/mixed-aspen forest, >40 percent tree cover, dominated by aspen or oak, conifer understory.
C, G	Early, Mid development-	18%	**Seed/sap, small - all cover classes** **Seed/sap-open, small-open** Mixed conifer forest w/ regeneration, 20-60 percent+ tree cover (Shade intolerant trees).
D, H	Mid, Late Development	14%	**Medium - all cover classes** Mixed conifer forest w/ regeneration, 20-60 percent+ tree cover (Shade intolerant, intermediate and tolerant trees).
E, F	Late Development - closed	40%	**Very Large-closed** Mixed conifer old forest w/ regeneration, 20-60 percent+ tree cover. Higher proportions can be expected for associations with longer stand replacement intervals (Shade intolerant and tolerant trees).

Table 19. Crosswalk between VDDT states and qualitative state descriptions used in alternative analysis for the Spruce-Fir PNVT

State (VDDT Model)	State (Qualitative)	Reference Percent	Description, Size and Cover Class
A	Early Development	9%	Grass/forb seedling/sapling w/ aspen, Douglas-fir, spruce, fir. 10-40 percent tree cover.
B	Early Forest	13%	**Seed/sap, small, medium, and very-large - all cover classes.** Grass/forb seedling/sapling w/ aspen, Douglas-fir, spruce, fir. Aspen/mixed -aspen, 0-10 percent.
C, G	Early, Mid development-	22%	**Seed/sap, small - all cover classes** **Seed/sap-open, small-open** Conifer early forest, 10-20 percent. Grass/forb seedling/sapling w/ aspen, Douglas-fir, spruce, fir. Aspen/mixed -aspen early forest, 0-10 percent. (Shade intolerant, intermediate and tolerant trees).
D, H	Young forest with regeneration	15%	**Medium - all cover classes** (Shade intolerant, intermediate and tolerant trees)
E, F	Mature/old forest w/ regeneration	44%	**Very Large-closed** Mature/old forest w regeneration (Shade intolerant and tolerant trees).

Fire Departure and Trend

The PNVTs historic fire return interval (HFRI) was the basis for making fire condition and trend predictions (Allen 1996). For example, a frequent fire PNVT would require frequent fire for that PNVT to have a low departure state or a trend moving towards desired conditions. Vegetation Condition Class (VCC) (LANDFIRE 2013) and analysis of fire severity was also used to examine fire departure in each PNVT. The dominant VCC class was used to describe each PNVT. For example, a PNVT may be classified as 50 percent VCC II (moderate departure), 25 percent VCC I (low departure), and 25 percent VCC III (high departure). VCC II would be the dominant condition class even though portions of the PNVT may be highly departed and portions of the PNVT may be at reference condition (VCC I).

Trends for fire return intervals were determined differently for Ponderosa Pine and Mixed Conifer with Frequent Fire than other PNVTs because plan objectives propose prescribed burning and the majority of fire treatments have occurred in these two types. The method for determining a predicted fire return interval was completed by taking the forestwide acreage of a PNVT and dividing it by the annual fire treatment acreage (provided by plan objectives in each alternative). This value was then evaluated to see where it fell relative to the PNVT's HFRI. For example, there are about 800, 000 acres of Ponderosa Pine forestwide. Therefore, forestwide fire treatment level of 100,000 acres per year of Ponderosa Pine would result in an 8 year fire return interval and a trend toward reference conditions. A forestwide fire treatment level of 52,000 acres per year for Ponderosa Pine would be at the upper end of the natural fire return interval (about 15 years) and result in a static trend. The other PNVTs lack plan objectives for prescribed burning, so the current fire return interval from the Ecological Sustainability Report was compared to the HFRI for each PNVT. If the current fire return interval was similar to the HFRI, then the trend was static. If there was a large difference between the current fire return interval and the HFRI, the trend would be away from desired conditions. Where current fire return interval values were unavailable in the Ecological Sustainability Report, estimates were made.

Predicting the condition of a PNVT was made by using the current vegetation departure summary rating and percentage of PNVT in each of the three FRCC classes and evaluating the effect of the predicted trend. Then the condition and trend for fire departure was made based on the anticipated fire treatment (based on plan objectives for each alternative). The current condition reflects vegetation composition and structure, but the predicted fire departures were derived solely on the anticipated fire frequency relative to the historic/reference fire frequency. For example, Great Basin Grassland PNVT currently has a low vegetative departure and is trending away from reference conditions. This PNVT is in VCC III (highly departed), and its fire severity is highly departed and trending away from reference conditions. VCC trend and fire severity correlate with the vegetative trend because vegetative structure correlates with fire severity and fire behavior.

The predicted annual acreage of wildfires managed for resource objectives is dependent on many factors beyond the control of managers such as other management direction, the agency's National Fire Policy, or environmental conditions. Actual treated acres could be less than predicted, and thus, they would contribute to trends away from reference conditions.

There is a range of plan objectives for prescribed fire treatments in Ponderosa Pine in alternatives B, C, and D (150,000 to 300,000 acres during 10 years following plan approval). The high end of fire treatment was modeled using VDDT. This is more acres than that completed in an average year. It was assumed that the low end of fire treatment objectives would not result in a trend

towards desired conditions because too few acres would be treated to be meaningful at the landscape level.

Assumptions for Fire

In the analysis for fire, additional assumptions were made:

- There is no surrogate for burning; it is critical to ecological restoration.
- Fire-adapted PNVTs have been without fire for about 130 years; therefore, movement towards historic fire return intervals will take time.
- The upper end of a PNVT's HFRI is necessary to maintain a static trend toward reference conditions for fire return interval. For Ponderosa Pine, this is 15 years.
- A range near midpoint of a PNVT's HFRI is necessary to result in a trend toward reference conditions for fire return interval. For Ponderosa Pine, this range is 6 to 10 years (midpoint 8 years).
- Movement towards desired conditions (i.e., to a "better" state or lower departure from a high to moderate departure) requires:
    - Mechanical or fire treatment that alters forest structure so characteristic fire severity could occur in an HFRI for many cycles to move to a low departure.
- Predicting future fire return intervals assumes that different areas are treated each year. For example, a 10,000-acre annual treatment would occur in different areas each year and result in 100,000 acres treated in 10 years.
- The upper end of HFRIs was estimated by evaluating the HFRI distributions in RM-GTR-286 (Allen 1996). For Ponderosa Pine and Frequent Fire Mixed Conifer, these distributions showed that a very small percentage of the sampled fire scars had HFRI greater than 15 years. The midpoint was simply estimated to be the midpoint of a commonly accepted HFRI range. For Ponderosa Pine, a 2- to 14-year range had a midpoint of 8 years.

Wildlife, Fish, and Plants

Information from the Ecological Sustainability Report (USDA Forest Service 2009b) (ESR) and the Analysis of the Management Situation (USDA Forest Service 2010a) were used as the foundation for existing conditions, trends, and issues, and the list of species to be analyzed. Discussions with other resource specialists, and information from their draft specialist's reports were also used for analysis. Whenever possible, species-specific habitat and locality data were used. Additionally, using species-habitat relationships, data was queried by PNVT to help with analysis of effects to species' habitats.

The list of forest planning species is based on the list of species that was brought forward for further consideration in the ESR with a few modifications based on new information. NatureServe conservation status ranks and Arizona Game and Fish Department's State Wildlife Action Plan (AZGFD 2010) list were rechecked to see if any updates since 2009 would result in changes to the list. Coconino NF biologists provided additional site specific information regarding species habitat relationships such as changes in primary PNVTs for individual species and the importance of ephemeral and intermittent riparian drainages for dispersal for certain amphibians and reptiles. Under an agreement with the forest, the Museum of Northern Arizona

summarized new and hard-to-find invertebrate information from literature and experts in the field (Stevens and Ledbetter 2012). Information from this agreement also modified the species list. Table 20 lists the changes to the forest planning species. The list of species analyzed is in the beginning of the "Wildlife, Fish, and Plants" section in the DEIS.

Table 20. Summary of changes to species list

Taxa	*Scientific Name*	Common Name	Change	Rationale
Bird	*Gymnorhinus cyanocephalus*	Pinyon jay	Added as forest planning species	A substantial portion of the pinyon pine on the forest died during a drought and insect outbreak in 2001-2002 on the forest significantly reducing habitat for this pinyon pine dependent species.
Bird	*Picoides dorsalis*	Three-toed woodpecker	Added as forest planning species	NatureServe conservation rank changed from S4 to S3 between 2009 and 2011. This is a priority bird species for spruce-fir in Arizona and the Coconino NF contains some of the only spruce-fir habitat in Arizona.
Invert.	*Acrolophitus nevadensis*	Nevada Pointed-headed Grasshopper	Dropped from further consideration.	There are only 4 records on or near the forest with 3 of those from 1938 (Stevens and Ledbetter 2012). In addition the life history and behavior of the species is poorly known so insufficient information is available to tie the species to specific plan components.
Invert.	*Cicindela oregona maricopa*	Maricopa Tiger Beetle	Dropped from further consideration.	This species is the most common tiger beetle in low elevation riparian habitats in its range and that several experts over the past decade have stated that it is not a high conservation priority (Stevens and Ledbetter 2012).
Invert.	*Apatania arizona, Atopsyche sperryi, Atopsyche tripunctata, Ceratopsyche venada, Chimarra primula, Culoptila kimminsi, Culoptila moselyi, Ithytrichia mexicana, Lepidostoma knulli, Nectopsyche dorsalis, Ochrotrichia ildria, Polycentropus gertschi, Protoptila balmorhea, Smidicrea dispar,*	Caddisflies	Dropped from further consideration.	Reasons: Not listed as species of concern by Arizona Game and Fish Department; U.S. Fish and Wildlife Service determined that insufficient information was available for listing (Stevens and Ledbetter (2012) or insufficient information for analysis or very few documented capture localities on the forest.

Taxa	*Scientific Name*	Common Name	Change	Rationale
Invert.	*Homoleptohyphes quercus*	A mayfly	Added as forest planning species	Inadvertantly dropped from 2009 list
Invert.	*Radiodiscus millecostatus*	Ribbed Pinwheel	Dropped from further consideration.	Habitat requirements are not well-known: no specific behavior information is available; insufficient information for analysis and species is widespread (Stevens and Ledbetter 2012).
Invert.	*Sonorella coltoniana, Sonorella compar, Sonorella micromphala*	Walnut Canyon Talussnail, Oak Creek Talussnail, Milk Ranch Talussnail	Dropped from further consideration.	Life histories and behavior are poorly known, ecological importance generally minor, hard to study. Distribution of the species is poorly known. More information is needed. This includes *Sonorella compar* (which has not been detected in 45 years), *S. coltoniana,* and *S. micromphala* (Milk Ranch talussnail) (collection location just outside Coconino NF). From Stevens and Ledbetter (2012).
Mammal	*Microtus longicaudus*	Long- Tailed Vole	Added as forest planning species	Inadvertently deleted from 2009 list
Mammal	*Myotis occultus*	Arizona myotis	Dropped from further consideration.	Arizona myotis has a widespread and abundant (S4) conservation status in AZ according to NatureServe, uses numerous types of roosts, a wide elevation range and variety of habitats.
Mammal	*Puma concolor*	Mountain lion	Species dropped from further consideration as a forest planning species but issue of habitat fragmentation and need for connectivity brought forward.	Mountain lions have a widespread and abundant (S4) conservation status in AZ according to NatureServe. This top predator is important in controlling populations of ungulates and smaller predators such as coyotes. Its movements, and movements of its prey, are threatened by large highway projects that will fragment habitat and development.
Plant	*Anulocaulis leiosolenus var. leiosolenus*	Southwestern ringstem	Dropped from further consideration.	Very few documented locations on forest and NatureServe conservation status is G4T3.

Taxa	*Scientific Name*	Common Name	Change	Rationale
Plant	*Arenaria fendleri var. porteri*	Porter sandwort	Dropped from further consideration.	The variety *porteri* is not recognized in the most current treatment of the species in Flora of North America (Vol. 5.)
Plant	*Asceplias quinquedentata*	Slimpod milkweed	Dropped from further consideration	There is insufficient information to determine species presence on forest.
Plant	*Cymopterus megacephalus*	Large leaf spring parsley	Dropped from further consideration	There is insufficient information to determine species presence on forest.
Plant	*Draba asprella var. stelligera*	Rough Whitlow-grass	Dropped from further consideration	Recently combined with var. *kaibabensis* (Flora of North America, Vol. 7, page 293). Variety is more widespread than previously thought (78 records on the forest) and is also found outside the forest in areas like Grand Canyon National Park which provides additional protections for the species.
Plant	*Epilobium oregonense*	Oregon willowherb	Dropped from further consideration.	Large range, not imperiled in most of its range. Two collections documented within forest boundary. The one on non-forest land has been developed. The other altered by severe wildfire since plant was collected there. The habitat on these sites is no longer suitable for the species.
Plant	*Eriogonum corymbosum var. glutinosum*	Wild Buckwheat	Dropped from further consideration.	The taxon has a large range, extending into Utah and Nevada and it appears secure throughout its range. The locations on the Coconino NF represent only a portion of its range.
Plant	*Lepidium montanum var. glabrum*	Mountain Pepperweed	Dropped from further consideration	There is insufficient information to determine species presence on forest.
Plant	*Moneses uniflora*	Wood nymph	Dropped from further consideration.	Wood nymph has a large range, extending throughout most of the western U.S. as far north as Canada and appears secure throughout most of its range. The locations on the Coconino NF represent only a small portion of its range.

Taxa	*Scientific Name*	Common Name	Change	Rationale
Plant	*Macromeria viridiflora var. thurberi*	Giant-trumpets	Dropped from further consideration.	There are about 60 records of collection for the species, *Macromeria viridiflora*, in the area. Most are not identified to variety, making distinction between varieties difficult.
Plant	*Macromeria viridiflora var. viridiflora*	Giant-trumpets	Dropped from further consideration.	There are about 60 records of collections for the species, *Macromeria viridiflora*, in the area. Most are not identified to variety, making distinction between varieties difficult.
Plant	*Mertensia macdougalii*	Macdougal's bluebells	Dropped from further consideration	There are 104 collections in SEINet from the forest, as well as Grand Canyon N.P., Grand Canyon Parashant which offer additional protection to the species[19]
Plant	*Penstemon caespitosus var. desertipicti*	Mat penstemon	Dropped from further consideration.	There are about 40 collection records representing multiple PNVTs within the planning area. The range includes Utah and is not listed as rare in the Utah Rare Plant Guide (2011)
Plant	*Penstemon linarioides ssp. compactifolius*	Toadflax beardtongue	Dropped from further consideration.	There are 28 collection records for this taxon in the Flagstaff area. Several are within the boundaries of National Parks or Monuments which provides additional protection for those populations. The range of the taxon includes parts of Nevada and it is not listed as rare in that area (Morefield, 2001)
Plant	*Perityle congesta*	Compacted Rock Daisy	Dropped from further consideration.	The single collection of this species on Coconino NF is many miles from the known range and needs to be verified.
Plant	*Phacelia crenulata var. angustifolia*	Cleftleaf scorpionweed	Dropped from further consideration.	No documented locations of this plant on the forest. The habitat and range of this taxon are north of the forest, extending northward into Utah.

[19] Southwest Environmental Information Network, SEINet, 2012. http//:swbiodiversity.org/seinet/index.php. Accessed on October 4, 2012

Taxa	*Scientific Name*	Common Name	Change	Rationale
Plant	*Polemonium pulcherrimum ssp. delicatum*	Beautiful Jacob's Ladder	Dropped from further consideration.	The range of the taxon is throughout most of the intermountain west. No data were found to indicate exceptional rarity or concern in other parts of the range.
Plant	*Ranunculus oregogenes*	Oregon buttercup	Dropped from further consideration.	Species is more widespread than previously thought, occurs in multiple PNVTs and in areas of Grand Canyon National Park and the Navajo Nation. There are 55 collections on the forest according to Seinet[20]
Plant	*Saxifraga cespitosa ssp. exaratoides*	Tufted saxifrage	Dropped from further consideration.	Latest treatment in Flora of North America does not recognize varieties or subspecies.
Plant	*Spiranthes romanzoffiana*	Hooded lady's tresses	Dropped from further consideration.	Although widely distributed in the northern U.S. and Canada, no accurate distribution for it on the Coconino NF is available.
Plant	*Utricularia vulgaris*	Common bladderwort	Dropped from further consideration.	*Utricularia vulgaris* has been combined with *U. macrorhiza,* a common and widespread species with a large range throughout most of the U.S.

For each species, the effects of the direction for program areas, management areas, and specific plan components that could have positive or negative impacts were evaluated. The primary evaluation criterion for effects was the "adequacy of guidance" for species and their habitats. Individual plan components such as standards and guidelines could have negative effects on species and their habitats when looked at singularly; however; the focus of analysis was to determine if overall guidance—proactive, maintenance, or mitigation—was sufficient to protect or enhance species and their habitats as site-specific projects are designed and implemented.

Species Viability Analysis

National Forest Management Act (NFMA) regulations currently in effect require that habitat is managed to support viable populations of native and desirable non-native vertebrates within the planning area (1982 planning rule provisions at 36 CFR219). Additionally, there is direction that habitats on national forests be managed to support viable populations of native and desired nonnative plants, fish, and wildlife and that "forest planning shall provide for diversity of plant and animal communities and tree species consistent with the over-all multiple-use objectives of the planning area." For planning purposes, a viable population is regarded as one that has the

[20] Southwest Environmental Information Network, SEINet. 2012. http//:swbiodiversity.org/seinet/index.php. Accessed on October 4, 2012.

estimated numbers and distribution of reproductive individuals to ensure its continued existence is well distributed in the planning area.

Since NFMA regulations require providing habitat for species viability within the planning area, the focus of this evaluation was on the condition of the habitat provided on Coconino NF. Condition was represented by departure values or distribution of vegetative states as described in the sections on Soil, Aquatic Systems, and Fire and Vegetation.

Lands in other ownerships may contribute to, or hinder, maintenance of species viability on National Forest System land, but they are not relied upon to meet the regulatory requirements. The section on cumulative effects considers intermixed ownerships and authorities that may affect the interactions of species among suitable habitat patches on National Forest System lands.

This evaluation compared how plan components in the different draft plan alternatives addressed habitat and species risks, so that viability could be maintained and would not contribute to species listing. There were 145 forest planning species analyzed. This included plant and terrestrial and aquatic animal species (out of greater than1800 species initially considered) found, or potentially found, on the Coconino NF. The process to identify forest planning species is described in the ESR and also described in the Wildlife, Fish, and Rare Plants section of the DEIS.

Following the identification of the forest planning species, a two-stage filtering process, coarse filter[21] and fine filter[22], was used to evaluate primary threats and whether plan direction that addressed the abundance, distribution, and habitat quality of each species adequately provided for species viability. The coarse filter/fine filter process considered habitat (coarse filter) and species specific needs (fine filter). Species were also evaluated at a finer level for habitat components (e.g., snags, downed woody debris, understory vegetation) not specifically addressed by broad habitat associations but necessary for specific species' life requirements. Species-specific plan direction was developed as needed and for those threats that the Forest Service could impact through management and which it has jurisdictional control. The subsequent viability evaluation process is summarized as follows.

The following steps further clarify and elaborate upon the analysis process described above:

[21] Example of coarse filter process: Fire exclusion (a threat) in ponderosa pine (a habitat) has resulted in increased stand density, increased competition, and increased canopy. Consequently, less sunlight reaches the ground in some areas compared to reference conditions, and the understory (grasses, forbs, and shrubs) has become less abundant, diverse, and vigorous. The long-tailed vole, a small mammal, relies on the understory in ponderosa pine for food and cover. They are threatened by reduced abundance and quality of the understory that is a consequence of fire exclusion. Plan components that address fire exclusion by promoting natural fire return intervals and fire severity and describe desirable understory conditions address the primary threats to the habitat and species. Consequently, in this example, plan components that address the threat of fire exclusion to ponderosa pine also address the primary habitat threat to long-tailed voles. As such, the coarse feature addresses the threats to this species.

[22] Example of fine filter process: Chiricahua leopard frogs are threatened by chytrid fungus, a disease that is fatal to amphibians. Desired conditions for PNVTs used by frogs describe the composition, structure and natural processes of their environment but do not address species specific threats. As such, the coarse filter process does not sufficiently address this species-specific threat, dropping this species into the fine filter process, during which guidelines were put into the plan specifically to address the threat of disease.

- **Step 1 - F Rank:** Forest Ranks (or F Ranks) were developed for the list of 146 forest planning species. The ranking process generally followed the conventions used by NatureServe and others in defining State and Global Ranks. The F Ranks were used in the viability risk assessment as a categorical variable representing a species' current abundance (table 21).
- **Step 2 - Habitat:** A list of primary habitats important to each species in the analyses was developed.
- **Step 3 - Abundance:** Abundance is the amount of habitat (
- Table 22) compared to reference conditions. In other words, was the Ponderosa Pine present now Ponderosa Pine in reference conditions? Effects from mixed ownerships (e.g., Ponderosa Pine within the forest boundary managed by the Arizona State Land Department), would be discussed under cumulative effects. Abundance values (consisting of rare, occasional, and common) were used to categorize the projected abundance of each habitat after 15 years of implementing each plan alternative. Fifteen years is considered the life of the plan during which a trajectory for habitat improvement or protection would be set. Fifteen years was also considered the point in time for which vegetative modeling would most accurately reflect progress toward achieving desired conditions and the consequences of plan direction between alternatives could be reasonably compared.
- **Step 4 - Habitat Quality:** Habitat quality (or departure values) (consisting of poor, fair, or good) were used to categorize the expected condition of PNVTs, (including the proportions of different vegetative states) or proper functioning riparian conditions relative to desired conditions within 15 years (table 23). In contrast to the abundance variable, habitat quality may affect the movements and interactions of individuals among the suitable habitat patches found on National Forest System lands. This approach relies on the assumption that conditions similar to that which supported associated species during recent evolutionary history would likely contribute to their maintenance in the future, and the further a habitat departs from reference distribution, the greater the risk to viability of associated species.
- **Step 5 - Likelihood of Limitation:** Habitat abundance and condition values were then combined to create one variable to indicate the general likelihood that the habitat would be limiting to populations of associated species (table 24 and table 25). This "likelihood of limitation" was described as low, low to moderate, moderate, or high. In general, quality habitat elements that are rare and in poor condition are those most likely to increase the likelihood of risk to viability of associated species; those that are common and in good condition are less likely to increase the risk to viability of associated species. In this general context, habitat limitation refers to a habitat factor, quantity, distribution, or quality,
- **Step 6 - Species Likelihood of Limitation Rating:** Providing for species viability requires providing habitat (within the capacity of the forest) in a condition that allow existing populations to persist. The ability of existing populations to respond to available habitat depends in part on the populations' current robustness, which is generally a function of size. In general, for a given habitat condition, small populations would be at greater risk than large populations. To reflect this, the likelihood of habitat limitation variable (Step 5) was combined with a species' F Rank (Step 1) for each species/habitat element interaction to generate this rating (table 26).

- **Step 7 - Coarse Filter Process:** PNVT abbreviations used in Step 7 and 8 are shown in table 27. Species addressed in the coarse filter process were those whose viability risk was due to habitat related threats and there were no species specific threats. The coarse filter analysis examined how habitat related plan components (primarily desired conditions) addressed habitat threats and provided for the viability of the species. The coarse filter did not adequately address the threats to all species. These species were carried forward for more detailed fine filter analysis (table 28, Table 29, and
- table 30).
- **Step 8 - Fine Filter Process:** The fine filter analysis showed how specific plan components (primarily standards and guidelines) addressed the species specific threats. The combination of plan components at the coarse and fine filter level is intended to maintain species viability.

Table 21. Description of F-ranks

F Ranking	Description
F1	Very rare on the forest within its habitat – occupies a very small portion of its habitat.
F2	Rare on the forest within its habitat - occupies a small portion of its habitat
F3	Uncommon on the forest within its habitat
F4	Common on the forest within its habitat
F5	Widespread and abundant on the forest within its habitat
F?	Present on the forest but abundance information is insufficient to develop risk
FP	Possibly could occur on the forest, but documented occurrences not known
FN	Occurs on the forest, but no breeding population is documented on the forest
FO	Occurs off the forest
FH	Occurred on forest historically, but no known extant populations

Table 22. Values used to categorize projected abundance of each habitat element

Habitat Abundance Value	Description
Rare	The habitat is substantially less abundant than during reference conditions.
Occasional	The habitat is somewhat less abundant than during reference conditions.
Common	The habitat is at least as abundant as during reference conditions.

Table 23. Values used to categorize quality of each habitat element

Value	Description of Habitat Quality Values
Poor	The structure, composition, and or functioning of habitat is in poor condition relative to reference conditions (over 66 percent departure).
Fair	The structure, composition, and or functioning of habitat is in fair condition relative to reference conditions (between 34-66 percent departure).

Value	Description of Habitat Quality Values
Good	The structure, composition, and/or functioning are similar to reference (<33 percent departure).

Table 24. Likelihood of limitation for habitat - Probability that habitat abundance and quality will be a limiting factor to associated species

Habitat Abundance	Habitat Condition		
	Poor	Fair	Good
Rare	High likelihood that habitat will be a limiting factor for species viability	High	Moderate likelihood that habitat could be a limiting factor for species viability
Occasional	High	Moderate	Low probability that habitat will be a factor in limiting species viability
Common	Moderate	Low-Moderate	Low

Table 25. Summary of expected abundance, quality, and likelihood of limitation for habitat, by forest plan revision alternative

	Cottonwood Willow Riparian				Mixed Broadleaf Deciduous Riparian				Montane Willow Riparian				Gallery Coniferous Riparian			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Abundance	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Condition	F	F	F	F	G	G	G	G	G	G	G	G	G	G	G	G
Likelihood of limitation	L-M	L-M	L-M	L-M	L	L	L	L	L	L	L	L	L	L	L	L
	Wetland Cienga				Desert Communities				Semidesert Grassland				Great Basin Grassland			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Abundance	O	O	O	O	C	C	C	C	C	C	C	C	C	C	C	C
Condition	F	G	G	G	P	P	P	P	P	P	P	P	G	G	G	G
Likelihood of limitation	M	L	L	L	M	M	M	M	M	M	M	M	L	L	L	L
	Montana/Subalpine Grassland				Interior Chaparral				Piñon Juniper with Grass				Piñon Juniper Evergreen Shrub			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Abundance	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C

	Montana/Subalpine Grassland				Interior Chaparral				Piñon Juniper with Grass				Piñon Juniper Evergreen Shrub			
Condition	G	G	G	G	G	G	G	G	F	F	F	F	F	F	F	F
Likelihood of limitation*	L	L	L	L	L	L	L	L	L-M	L-M	L-M	L-M	L-M	L-M	L-M	L-M
	Piñon Juniper Woodland				**Ponderosa Pine**				**Mixed Conifer Frequent Fire**				**Mixed Confier with Aspen**			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Abundance	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Condition	G	G	G	G	F	F	F	F	F	F	F	F	F	F	F	F
Likelihood of limitation	L	L	L	L	L-M	L-M	L-M	L-M	L-M	L-M	L-M	L-M	L-M	L-M	L-M	L-M
	Spruce Fir				**Alpine Tundra**				**Springs**				**Cliff**			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Abundance	C	C	C	C	C	C	C	C	O	O	O	O	C	C	C	C
Condition	F	F	F	F	F	F	F	F	F	F	F	F	G	G	G	G
Likelihood of limitation	L-M	L-M	L-M	L-M	L-M	L-M	L-M	L-M	M	M	M	M	L	L	L	L

	Streams			
	A	B	C	D
Abundance	C	C	C	C
Condition	F	F	F	F
Likelihood of limitation	L-M	L-M	L-M	L-M

Table 26. Likelihood of species limitation as a function of F Rank and limitations associated with habitat

F Rank	Likelihood of Limitation			
	High	Moderate	Low to Moderate	Low
F1 Species is very rare on the forest within its habitat.	Very High	High	Moderate-High	Moderate
F2 Species is rare on the forest within its habitat.	High	Moderate-High	Moderate-High	Moderate
F3 Uncommon on the forest within its habitat	Moderate-High	Moderate	Low-Moderate	Low

F Rank	Likelihood of Limitation			
	High	Moderate	Low to Moderate	Low
F4 Common on the forest within its habitat	Moderate	Low-Moderate	Low-Moderate	Low
F5 Widespread and abundant on the forest within its habitat	Low-Moderate	Low	Low	Low
F? ,FP, FN F? – present on the forest, but abundance information is insufficient to develop risk FP- possibly could occur on the forest, but documented occurrences not known FN – occurs on the forest, but no breeding population is documented on the forest	High	Moderate	Low-Moderate	Low
FH Occurred on the forest historically, but no known extant populations	High	Moderate	Low-Moderate	Low
FO Occurs off of the forest	Not Applicable	Not Applicable	Not Applicable	Not Applicable

As described above, associations of very rare species with habitat elements that are likely to be most limiting were identified as those most at risk; associations of more common species with habitats less likely to be limiting received lower risk ratings.

Table 27. PNVT abbreviations

Abbreviation	PNVT name
DC	Desert Communities
IC	Interior Chaparral
CWRF	Cottonwood Willow Riparian Forest
MBDRF	Mixed Broadleaf Deciduous Riparian Forest
MWRF	Montane Willow Riparian Forest
GCRF	Gallery Coniferous Riparian Forest
WC	Wetland/Cienega
SDG	Semidesert Grassland
GBG	Great Basin Grassland
MSG	Montane/Subalpine Grassland
PJG	Piñon-Juniper with Grass

Abbreviation	PNVT name
PJES	Piñon-Juniper Evergreen Shrub
PJW	Piñon-Juniper Woodland
PP	Ponderosa Pine
MCFF	Mixed Conifer with Frequent Fire
MCA	Mixed Conifer with Aspen
SF	Spruce Fir
AT	Alpine Tundra

Table 28. Likelihood of threatened and endangered species limitations, by alternative

Species	F Ranking	Habitat	A	B	C	D
Chiricahua leopard frog	F1	CWRF	M-H	M-H	M-H	M-H
		MBDRF	M	M	M	M
		MWRF	M	M	M	M
		WC	H	M	M	M
		Springs	H	H	H	H
		Ephemeral Intermittent Drainages	Discussed qualitatively			
California condor	FN	Cliffs	L	L	L	L
Mexican spotted owl	F2	PP	M-H	M-H	M-H	M-H
		MCFF	M-H	M-H	M-H	M-H
		MCA	M-H	M-H	M-H	M-H
		Cliffs	M	M	M	M
Southwestern willow flycatcher	F1	CWRF	M-H	M-H	M-H	M-H
		MBDRF	M	M	M	M
		MWRF	M	M	M	M
		Springs	H	H	H	H
Yuma clapper rail	FP	CWRF	L-M	L-M	L-M	L-M
		MBDRF	L	L	L	L
		WC	L-M	L	L	L
Little Colorado spinedace	F1	MWRF	M	M	M	M
		GCRF	M	M	M	M
		Streams	M-H	M-H	M-H	M-H
Spikedace	F1	CWRF	M-H	M-H	M-H	M-H
		MBDRF	M	M	M	M
		Streams	M-H	M-H	M-H	M-H
Gila trout	FH	MBDRF	L	L	L	L
		MWRF	L	L	L	L
		GCRF	L	L	L	L
		Streams	L-M	L-M	L-M	L-M

Species	F Ranking	Habitat	A	B	C	D
Loachminnow	F1	CWRF	M-H	M-H	M-H	M-H
		MBDRF	M	M	M	M
		MWRF	M	M	M	M
		GCRF	M	M	M	M
		Streams	M-H	M-H	M-H	M-H
Gila chub	F1	CWRF	M-H	M-H	M-H	M-H
		MBDRF	M	M	M	M
		Streams	M-H	M-H	M-H	M-H
Gila topminnow	F1	CWRF	M-H	M-H	M-H	M-H
		MBDRF	M	M	M	M
		Springs	H	H	H	H
		Streams	M-H	M-H	M-H	M-H
Razorback sucker	F2	CWRF	M-H	M-H	M-H	M-H
		MBDRF	M	M	M	M
		Streams	M-H	M-H	M-H	M-H
Colorado pikeminnow	F2[1], FN	CWRF	M-H	M-H	M-H	M-H
		MBDRF	M	M	M	M
		Streams	M-H	M-H	M-H	M-H
Black-footed ferret	FH	GBG	L	L	L	L
		MSG	L	L	L	L
		PJG	L-M	L-M	L-M	L-M
Mexcian gray wolf	FN	No primary. Many PNVTs above the Rim	Discussed qualitatively			
Arizona Cliffrose	F1	DC	H	H	H	H
		Verde Formation	Discussed qualitatively			
San Francisco Peaks Groundsel	F1	AT	M-H	M-H	M-H	M-H
		Talus Slopes	Discussed Qualitatively			

[1] The rarest F-rank was used.

Table 29. Likelihood of limitations to Forest Service sensitive species by habitat and special feature by alternative

Species	F-ranking	Habitat	A	B	C	D
Arizona toad	FH	CWRF	L-M	L-M	L-M	L-M
		MBDRF	L	L	L	L
		Springs	M	M	M	M
		Ephemeral Intermittent Drainage	Discussed qualitatively			
Lowland leopard frog	F1	CWRF	M-H	M-H	M-H	M-H
		MBDRF	M	M	M	M
		WC	H	M	M	M
		Springs	H	H	H	H
		Ephemeral Intermittent Drainage	Discussed qualitatively			
Northern leopard frog	F2	WC	M-H	M	M	M
		Springs	M-H	M-H	M-H	M-H
		Ephemeral Intermittent Drainage	Discussed qualitatively			
		Constructed waters	Discussed qualitatively			
Abert's towhee	F3	CWRF	L-M	L-M	L-M	L-M
		Ephemeral Intermittent Drainage and Mesquite	Discussed qualitatively			
American peregrine falcon	F4	Cliffs	L	L	L	L
Bald eagle	F3	CWRF	L-M	L-M	L-M	L-M
		MBDRF	L	L	L	L
		MWRF	L	L	L	L
		PP	L-M	L-M	L-M	L-M
		Cliffs	L	L	L	L
Clark's grebe	F3	WC	M	L	L	L
Common black hawk	F4	CWRF	L-M	L-M	L-M	L-M
		MBDRF	L	L	L	L
		MWRF	L	L	L	L

Species	F-ranking	Habitat	A	B	C	D
Ferruginous hawk	F3	SDG	M	M	M	M
		GBG	L	L	L	L
		MSG	L	L	L	L
Northern goshawk	F2	PP	M-H	M-H	M-H	M-H
		MCFF	M-H	M-H	M-H	M-H
		MCA	M-H	M-H	M-H	M-H
Western burrowing owl	FP	GBG	L	L	L	L
		MSG	L	L	L	L
		PJG	L-M	L-M	L-M	L-M
Western yellow-billed cuckoo	F2	CWRF	M-H	M-H	M-H	M-H
		MBDRF	M	M	M	M
		Mesquite bosques	Discussed qualitatively			
Bluehead sucker, Desert sucker, Sonora sucker, Little Colorado sucker	F3	CWRF	L-M	L-M	L-M	L-M
		MBDRF	L	L	L	L
		MWRF	L	L	L	L
		GCRF	L	L	L	L
		Streams	L-M	L-M	L-M	L-M
Longfin dace	F3	CWRF	L-M	L-M	L-M	L-M
		MBDRF	L	L	L	L
Headwater chub and Roundtail chub	F2	CWRF	M-H	M-H	M-H	M-H
		MBDRF	M	M	M	M
		MWRF	M	M	M	M
		GCRF	M	M	M	M
		Streams	M-H	M-H	M-H	M-H
A mayfly	F1	Streams	M-H	M-H	M-H	M-H
		MBDRF	M	M	M	M

Species	F-ranking	Habitat	A	B	C	D
California floater	FH	CWRF	L-M	L-M	L-M	L-M
		GCRF	L	L	L	L
		MWRF	L	L	L	L
		MBDRF	L	L	L	L
		Streams	L-M	L-M	L-M	L-M
		Springs	M	M	M	M
Fossil springsnail	F1	CWRF	M-H	M-H	M-H	M-H
		MBDRF	M	M	M	M
		Springs	H	H	H	H
		Streams	M-H	M-H	M-H	M-H
Four-spotted skipperling	F3	MWRF	L	L	L	L
		WC	M	L	L	L
		Springs	M	M	M	M
Nitocris fritillary	F3	WC	M	L	L	L
		Springs	M	M	M	M
Nokomis fritillary	FO	WC	N/A	N/A	N/A	N/A
		Springs	N/A	N/A	N/A	N/A
Page springsnail	F1	Springs	H	H	H	H
		Streams	M-H	M-H	M-H	M-H
		CWRF	M-H	M-H	M-H	M-H
Allen's lappet-browed bat	F3	MCFF	L-M	L-M	L-M	L-M
		MCA	L-M	L-M	L-M	L-M
		PP	L-M	L-M	L-M	L-M
		Caves	Discussed qualitatively			
Dwarf shrew	F2	Talus slopes in MSG, SF, AT	Discussed qualitatively			
Greater Western mastiff bat	FN	Cliffs	L	L	L	L

Species	F-ranking	Habitat	A	B	C	D
Long-tailed vole	F3	MSG	L	L	L	L
		SF	L-M	L-M	L-M	L-M
		MCFF	L-M	L-M	L-M	L-M
		MCA	L-M	L-M	L-M	L-M
		AT	L-M	L-M	L-M	L-M
		PP	L-M	L-M	L-M	L-M
Merriam's shrew	F3	PJG	L-M	L-M	L-M	L-M
		PP	L-M	L-M	L-M	L-M
		MSG	L	L	L	L
Navajo Mogollon vole	F3	PP	L-M	L-M	L-M	L-M
		MCFF	L-M	L-M	L-M	L-M
		MCA	L-M	L-M	L-M	L-M
		PJW	L	L	L	L
Pale Townsend's Big-Eared Bat	F3	Cliffs	L	L	L	L
		Caves	Discussed qualitatively			
		Archaeological sites	Discussed qualitatively			
Plains harvest mouse	F2	DC	M-H	M-H	M-H	M-H
		SDG	M-H	M-H	M-H	M-H
		IC	M	M	M	M
Southwestern river otter	FH	CWRF	L-M	L-M	L-M	L-M
		MBDRF	L	L	L	L
		Streams	L-M	L-M	L-M	L-M
Spotted bat	FN	Cliffs	L	L	L	L
		Caves	Discussed qualitatively			
Western red bat	F3	PP	L-M	L-M	L-M	L-M
(Deciduous trees)		CWRF	L-M	L-M	L-M	L-M
		MBDRF	L	L	L	L
		MWRF	L	L	L	L
Wupatki Arizona pocket mouse	F2	GBG	M	M	M	M

Species	F-ranking	Habitat	A	B	C	D
Alcove bog orchid	F1	MBDRF	M	M	M	M
Arizona bugbane	F1	MBDRF	M	M	M	M
		GCRF	M	M	M	M
		MWRF	M	M	M	M
Arizona sneezeweed	F2	PP	M-H	M-H	M-H	M-H
		MSG	M	M	M	M
		WC	M-H	M	M	M
Arizona sunflower	F1	GBG	M	M	M	M
Bebb's willow and Blumer's dock	F1	MWRF	M	M	M	M
		Springs	H	H	H	H
Cliff fleabane	F1	Cliffs	M	M	M	M
Cochise sedge	F1	MBDRF	M	M	M	M
		MWR	M	M	M	M
		Springs	H	H	H	H
Crenulate moonwort	F1	AT	M-H	M-H	M-H	M-H
Disturbed (Tusayan) rabbitbrush	F1	GBG	M	M	M	M
Flagstaff beardtongue	F3	PJES	L-M	L-M	L-M	L-M
		PP	L-M	L-M	L-M	L-M
Flagstaff pennyroyal	F1	PP	M-H	M-H	M-H	M-H
		Limestone cliffs and ledges	Discussed qualitatively			
Grand Canyon agave	F1	DC	H	H	H	H
		SDG	H	H	H	H
		PJES	M-H	M-H	M-H	M-H
		Archaeological sites	Discussed qualitatively			
Hairy clematis	F1	PP	M-H	M-H	M-H	M-H
Heath-Leaf wild buckwheat	F1	DC	H	H	H	H
		Verde Formation	Discussed qualitatively			
Lyngholm's cliffbrake	F1	Cliffs	M	M	M	M

Species	F-ranking	Habitat	A	B	C	D
Metcalfe's tick trefoil	F1	MBDRF	M	M	M	M
		PJES	M-H	M-H	M-H	M-H
Mogollon thistle	F1	Springs	H	H	H	H
Mt Dellenbaugh sandwort	F1	SDG	H	H	H	H
		IC	M	M	M	M
		PJES	M-H	M-H	M-H	M-H
		PP	M-H	M-H	M-H	M-H
Ripley's wild buckwheat	F1	DC	H	H	H	H
		Verde Formation	Discussed qualitatively			
Rusby's milkwort, Verde Valley sage	F2	DC	M-H	M-H	M-H	M-H
		SDG	M-H	M-H	M-H	M-H
		PJES	M-H	M-H	M-H	M-H
		Verde Formation	Discussed qualitatively			
Rusby milkvetch	F1	PP	M-H	M-H	M-H	M-H
		MCA	M-H	M-H	M-H	M-H
Senator Mine alum-root	F1	Cliffs	M	M	M	M
Sunset Crater beardtongue	F1	Cinder soils	Discussed qualitatively			
		PP	M-H	M-H	M-H	M-H
Tonto Basin agave	F1	SDG	H	H	H	H
		DC	H	H	H	H
		PJES	M-H	M-H	M-H	M-H
		Archaeological sites	Discussed qualitatively			
Narrow-headed gartersnake	F1	CWRF	M-H	M-H	M-H	M-H
		MBDRF	M	M	M	M
		MWRF	M	M	M	M
		Streams	M-H	M-H	M-H	M-H

Species	F-ranking	Habitat	A	B	C	D
Northern Mexican gartersnake	F1	CWRF	M-H	M-H	M-H	M-H
		MBDRF	M	M	M	M
		WC	H	M	M	M
		Streams	M-H	M-H	M-H	M-H
		Ephemeral Intermittent Drainages	Discussed qualitatively			
Reticulate gila monster	F3	DC	M	M	M	M
		IC	L	L	L	L
		CWRF	L-M	L-M	L-M	L-M
		SDG	M	M	M	M
		PJES	L-M	L-M	L-M	L-M
		Ephemeral Intermittent Drainages	Discussed qualitatively			

Table 30. Likelihood of limitations to other species by habitat and special feature by alternative

Species	F-ranking	Habitat	A	B	C	D
Evening grosbeak	F3	MCFF	L-M	L-M	L-M	L-M
		MCA	L-M	L-M	L-M	L-M
Golden eagle	F3	Cliffs	L	L	L	L
		PP	L-M	L-M	L-M	L-M
Golden-crowned Kinglet	F3	MCFF	L-M	L-M	L-M	L-M
		MCA	L-M	L-M	L-M	L-M
		SF	L-M	L-M	L-M	L-M
McGillivray's Warbler	F4	MBDRF	L	L	L	L
		MWRF	L	L	L	L
		MCFF	L-M	L-M	L-M	L-M
		MCA	L-M	L-M	L-M	L-M
Pinyon jay	F4	PJES	L-M	L-M	L-M	L-M
		PJG	L-M	L-M	L-M	L-M
		PJW	L	L	L	L

Species	F-ranking	Habitat	A	B	C	D
Swainson's thrush	F1	MCA	M-H	M-H	M-H	M-H
		SF	M-H	M-H	M-H	M-H
Three-toed woodpecker	F3	MCFF	L-M	L-M	L-M	L-M
		MCA	L-M	L-M	L-M	L-M
		SF	L-M	L-M	L-M	L-M
Alberta arctic	F2/F3	MSG	M	M	M	M
		MCA	M-H	M-H	M-H	M-H
		Springs	M-H	M-H	M-H	M-H
Arizona Snaketail, Persephone's darner	F2	CWRF	M-H	M-H	M-H	M-H
		MBDRF	M	M	M	M
		Streams	M-H	M-H	M-H	M-H
		Springs	M-H	M-H	M-H	M-H
Redrock Stonefly	F1	MBDRF	M	M	M	M
		CWRF	M-H	M-H	M-H	M-H
		Streams	M-H	M-H	M-H	M-H
		Springs	H	H	H	H
Beaver	F3	CWRF	L-M	L-M	L-M	L-M
		MBDRF	L	L	L	L
		MWRF	L	L	L	L
		Streams	L-M	L-M	L-M	L-M
Gunnison's prairie dog	F3	GBG	L	L	L	L
		MSG	L	L	L	L
		PJG	L-M	L-M	L-M	L-M
Pronghorn antelope	F3	GBG	L	L	L	L
		SDG	M	M	M	M
		MSG	L	L	L	L
Southwestern myotis	F3	PP (Gambel oak subtype)	L-M	L-M	L-M	L-M
Apache beardtongue	F1	MSG	M	M	M	M

Species	F-ranking	Habitat	A	B	C	D
Arizona Phlox	F3	PJG	L-M	L-M	L-M	L-M
		PP	L-M	L-M	L-M	L-M
		DC	M	M	M	M
		SDG	M	M	M	M
Arizona Whitefeather	F1	Cliffs	M	M	M	M
Aspen	F3	PP	L-M	L-M	L-M	L-M
		MCFF	L-M	L-M	L-M	L-M
		MCA	L-M	L-M	L-M	L-M
		SF	L-M	L-M	L-M	L-M
Basin Bladderpod	F3	DC	M	M	M	M
		SDG	M	M	M	M
		PJES	L-M	L-M	L-M	L-M
Bearded Cinquefoil	F1	PP	M-H	M-H	M-H	M-H
Bearded gentian	F3	AT	L-M	L-M	L-M	L-M
Bigelow's Onion	F2	DC	M-H	M-H	M-H	M-H
		SDG	M-H	M-H	M-H	M-H
Black Dropseed	F3	PP	L-M	L-M	L-M	L-M
		GBG	L	L	L	L
		MSG	L	L	L	L
		PJES	L-M	L-M	L-M	L-M
		PJG	L-M	L-M	L-M	L-M
Black spleenwort and Ebony spleenwort	F1	Cliffs	M	M	M	M
Blackroot sedge	F1	AT	M-H	M-H	M-H	M-H
Bollander’s quillwort	F1	WC	H	M	M	M
Bristlecone pine	F3	SF	L-M	L-M	L-M	L-M
Colorado Blue Columbine	F1	MCA	M-H	M-H	M-H	M-H
		SF	M-H	M-H	M-H	M-H

Species	F-ranking	Habitat	A	B	C	D
Common moonwort	F1	MSG	M	M	M	M
		SF	M-H	M-H	M-H	M-H
		AT	M-H	M-H	M-H	M-H
Corkbark(subal pine) fir	F3	SF	L-M	L-M	L-M	L-M
Creeping Milkvetch	F3	PJES	L-M	L-M	L-M	L-M
		PP	L-M	L-M	L-M	L-M
Dane's dwarf gentian	F1	AT	M-H	M-H	M-H	M-H
Diamond Valley Suncup	F1	Cinder soils	Discussed qualitatively			
Different-nerve sedge	F1	AT	M-H	M-H	M-H	M-H
Fossil Creek bedstraw	F1	Cliffs	M	M	M	M
Graceful buttercup	F1	SF	M-H	M-H	M-H	M-H
		AT	M-H	M-H	M-H	M-H
Grassy slope sedge	F1	MSG	M	M	M	M
		MWRF	M	M	M	M
		AT	M-H	M-H	M-H	M-H
Hall's milkweed	F1	MCA	M-H	M-H	M-H	M-H
James rubberweed	F2	PJES	M-H	M-H	M-H	M-H
		PP	M-H	M-H	M-H	M-H
Jones spider flower	F3	CWRF	L-M	L-M	L-M	L-M
		MBDRF	L	L	L	L
		MWRF	L	L	L	L
		DC	M	M	M	M
		SDG	M	M	M	M
		PJES	L-M	L-M	L-M	L-M
Jones' Wild Buckwheat	F2	PJG	M-H	M-H	M-H	M-H
		PP	M-H	M-H	M-H	M-H
Macdougal's aletes	F1	MCFF	M-H	M	M	M

Species	F-ranking	Habitat	A	B	C	D
Macoun's false bindweed	F1	Human Structures	Discussed qualitatively			
Mearn's lotus	F3	DC	M	M	M	M
		SDG	M	M	M	M
		PJES	L-M	L-M	L-M	L-M
		PP	L-M	L-M	L-M	L-M
New Mexico Alum-root	F1	MBDRF	M	M	M	M
		Cliffs	M	M	M	M
Oak Creek Triteleia	F2	PP	M-H	M-H	M-H	M-H
		WC	M-H	M	M	M
Pond lily	F1	WC	H	M	M	M
Reflected moonwort	F1	SF	M-H	M-H	M-H	M-H
Rothrock's Hedge-nettle	F2	GBG	M-H	M-H	M-H	M-H
		MSG	M	M	M	M
		PJES	M-H	M-H	M-H	M-H
		PP	M-H	M-H	M-H	M-H
		MCA	M-H	M-H	M-H	M-H
Rough Whitlow-grass (Draba asprella var. asprella)	F1	PP	M-H	M-H	M-H	M-H
		MBDRF	M	M	M	M
Serrate Phacelia	F3	PP	L-M	L-M	L-M	L-M
		Cinder soils	Discussed qualitatively			
Silver Milkvetch	F1	PJES	M-H	M-H	M-H	M-H
Skunk-top Scurfpea	F1	SDG	H	H	H	H
		PJES	M-H	M-H	M-H	M-H
Spider saxifrage	F1	AT	M-H	M-H	M-H	M-H
Thurber's (Scarlet) cinquefoil	F1	PP	M-H	M-H	M-H	M-H

Species	F-ranking	Habitat	A	B	C	D
Timberland Blue-eye-grass	F1	MSG	M	M	M	M
		PP	M-H	M-H	M-H	M-H
		MCFF	M-H	M-H	M-H	M-H
		MCA	M-H	M-H	M-H	M-H
		SF	M-H	M-H	M-H	M-H
		AT	M-H	M-H	M-H	M-H
Utah bladder fern	F2	Cliffs	M	M	M	M
Western Mouse-tail	F2	PJES	M-H	M-H	M-H	M-H
		PP	M-H	M-H	M-H	M-H
Western porterella	F1	Ephemeral and intermittent drainages	M-H	M-H	M-H	M-H
Yavapai Wild Buckwheat	F2	PJG	M-H	M-H	M-H	M-H

Assumptions for Wildlife, Fish, and Plants

- Fifteen years was the timeframe used for the species analysis because it is the life of the plan, and there is more certainty with the models within this timeframe.
- Habitat conditions similar to those which supported associated species during reference conditions would likely contribute to their maintenance in the future, and the further a habitat departs from those conditions, the lower the likelihood that it is sustainable and the greater the risk to viability of associated species.
- Risks to some species are the same as the risks to the PNVTs in which they occur. It was assumed that actions to address the risks or departures in these PNVTs would benefit the species as well.
- Little change to the amount of habitat, or habitat abundance, has occurred between reference conditions and the present. In other words, the Cottonwood Willow Riparian Forest on the forest now was Cottonwood Willow Riparian Forest in reference conditions. Little change to the amount of cliffs on the forest has occurred since reference conditions, and because little management occurs on cliffs, little change to the quality of cliff habitat has occurred.
- It was assumed that the states in the Ponderosa Pine Gambel Oak subtype was proportional to the states in the Ponderosa Pine PNVT as a whole.

Climate Change

Each resource within the Coconino NF was analyzed with the awareness that natural ecosystems are regulated by climate, and climate is to some degree determined by natural ecosystems. With the awareness and indicators of climate change currently emerging across each resource, monitoring and management direction will be dynamic through the life of the revised plan.

Assumptions for Climate Change

- Resource area assumptions are consistent with the regional policies described in Southwestern Region Climate Change Trends and Forest Planning (USDA Forest Service 2010c). While many factors influence climate in the Southwest during a particular year or season, predictable patterns hold across the years and decades to define the region's climate.
    - The overall aridity relates to a global circulation pattern known as Hadley circulation, which creates a semi- permanent high-pressure zone over the Southwest.
    - Relatively high temperatures with dynamic daily swings define this geographic region.
    - Mountains and other differences in elevation affect local climate patterns.
    - The North American Monsoon works to bring moisture from the tropics into the region during the summer months.
- Based on Multi-Model ensemble climate models, by the end of the century, the Southwest is likely to experience:
    - Temperatures increases of 5 to 8 degrees Fahrenheit.
    - An increase in the number of extremely hot days, with summer heat waves lasting 2 weeks or longer.
    - Warmer winters and reduced snowpack, and a later monsoonal season.
    - A 5 percent drop in precipitation in most of Arizona and New Mexico; possible 10 percent drop in southern Arizona.
    - An increase in extreme flood events following an overall increase in tropical storms.
    - Projected decreases in precipitation, reduced snowpack, and overall water availability.
    - Increased risk from wildfire, insects and disease, invasive species.
    - Potential decrease in ecosystem productivity from water limitations and increased heat.
    - Potential impacts to alpine, riparian, wetland, sky Island, and aquatic habitats.
- Climate modeling is a developing science
    - Newer multi-model ensembles are "better than the sum of their parts," and are used increasingly for projection climate change in the Southwest.
    - Downscaling techniques, including Statistical Downscaling, Dynamical Downscaling, and Sensitivity Analysis, are improving.
    - Regional Modeling, which incorporates jet Stream activity, tropical storm and monsoon tracking, and regional elevation effects, have a high potential to improve localized climate projections.
    - As yet, no reliable climate models at the forest-scale.

- Climate and Southwestern Ecosystems
  - Projected decreases in precipitation, reduced snowpack, and overall water availability.
  - Increased risk from wildfire, insects and disease, invasive species.
  - Potential decrease in ecosystem productivity from water limitations and increased heat.
  - Potential impacts to alpine, riparian, wetland, sky Island, and aquatic habitats.

Recreation

Developed and Dispersed Recreation and Special Uses

The Recreation Opportunity Spectrum (ROS) provides a framework which allows administrators to manage and users to enjoy a variety of recreation environments. ROS is not a land classification system; it is a management objective, a way of describing and providing a variety of recreation opportunities (USDA Forest Service 1982b).

The ROS provides a framework for stratifying and defining classes of outdoor recreation environments, activities, and experience opportunities. The settings, activities, and opportunities for obtaining experiences have been arranged along a spectrum divided into six classes shown in the figure below (USDA, 1990). The names of the classes are descriptive to provide utility in land management planning and other applications. Each class is defined in terms of its combination of activity, setting, and experience opportunities (USDA 1990). Opportunities for experience along the spectrum (Figure C- 3) represent a range from a very high probability of solitude, self-reliance, challenge, and risk (i.e., primitive) to a very social experience where self-reliance, challenge and risk are relatively unimportant (i.e., rural or urban) (USDA 1990).

The basic assumption underlying the ROS is that quality in outdoor recreation is best assured through provision of a diverse set of opportunities. Providing a wide range of settings varying in level of development, access, and other factors, insures the broadest segment of public will find quality recreational experiences, both now and in the future. Although the notion of quality is relative—a value judgment—the concept of quality can be stated for management decision purposes in this way: quality depends on what experiences the individual is looking for, how much of it is realized, and the degree of satisfaction (USDA 1990).

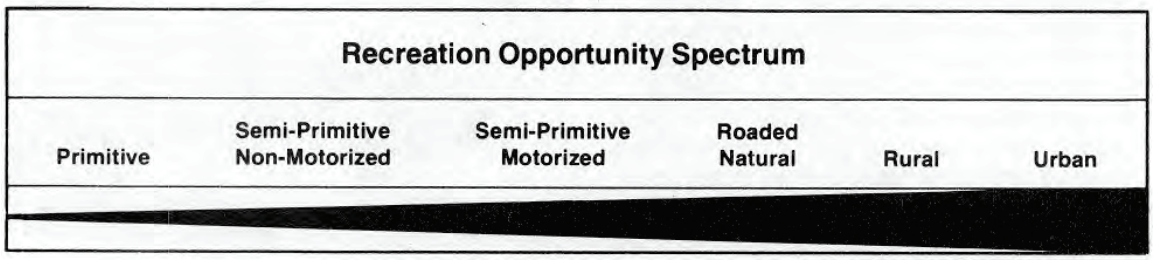

Figure C- 3. Recreation Opportunity Spectrum Classes (USDA Forest Service 1986, II-30)

A recreation opportunity setting is defined as the combination of physical, biological, social, and managerial conditions that give value to a place. Thus, an opportunity includes qualities provided by nature (vegetation, landscape, topography, scenery), qualities associated with recreational uses

(levels and types of use), and conditions provided by management (developments, roads, regulations). By combining variations of these qualities and conditions, management can provide a variety of opportunities for recreationists (USDA, 1990).

Throughout the range of Alternatives there are three different methodologies used for delineating ROS classes. Mapping of the ROS is not an exact science (USDA Forest Service 2003); therefore, as each ROS was developed, each incorporated the best available science and GIS techniques. The original ROS was created for the existing plan and is retained under Alternative A. The ROS under Alternative A underwent numerous revisions and changes through amendments to the 1987 Forest Plan.

The methodology used for the inventory of existing conditions was applied agency protocols established in 2003 (USDA Forest Service 2003). The existing condition ROS mapping process was completed by TEAMS Enterprise and was reviewed, edited, and finalized through an interdisciplinary approach during the Plan Revision Process (Hill 2011).

The ROS methodology used to map the desired conditions under Alternatives B, C and D took a raster-based GIS approach which incorporated and elaborated on the 2003 theories and protocol. Through the use of map algebra naturalness, access, remoteness, facilities and site management were incorporated to identify the spatial arrangement of recreational opportunities and ROS classes throughout the forest (Hill 2011).

The Wilderness Opportunity Spectrum (WOS), an extension of the ROS, was developed to address the specific recreational experiences and management complexities found within wilderness areas. Wilderness has been designated to provide for the recreational and experiential opportunities of solitude found within primitive and pristine natural ecosystems. “Primitive, as defined within the ROS context, is an extremely broad category and when applied within Wilderness, does not adequately differentiate the characteristics and attributes of the setting” (USDA Forest Service 2003) Through the four unique classifications (Transitions, Semi-Primitive, Primitive and Pristine) found within the WOS, the uniqueness of these areas can be identified and managed accordingly.

Unlike the ROS, an accepted protocol for mapping and identifying WOS classes currently does not exist. Under Alternative A, and the 1987 plan, the WOS was created through a small interdisciplinary team and hand drawn on 1:24,000 USGS quarter quadrangle Mylar maps. These maps were scanned, geo-referenced and digitized within GIS and incorporated under alternative A. The WOS developed for alternatives B, C and D applied modern GIS techniques, best available data, and thusly a more consistent methodology through addressing more site and value specific parameters than was used under alternative A. Building off the raster concepts and techniques used for the ROS, the WOS under alternative B took into consideration the natural character, types and levels of recreational use, access, remoteness and existing management directions of Wilderness Areas (See project record for detailed methodologies).

The National Visitor Use Monitoring project is a nationwide survey that is conducted on every national forest every 5 years. The surveys are in-person exit interviews and are administered at sites that are selected from a stratified random sample based on level of use (high, medium and low) and type of site (day-use, overnight, general forest and wilderness). The sample is used to estimate forest-level visitation data based on a model that is designed based on nation-wide trends and assumptions. This ensures that all national forest visitor estimates are comparable. The

corresponding limitation is that it cannot be generalized below the forestwide level without supplemental collections. The reliability of the data also is dependent upon the consistent classification of sites and survey design as well as the assumption that the on-the-ground conditions are not very unusual. For example, a year with no snow and lengthy forestwide fire closures would yield very low results because of an abnormal amount of canceled survey days and reduced winter recreation. This report uses data from the 2010 survey and revised 2005 data. The original 2005 data had much wider confidence intervals and higher error rates but adjustments to the estimation methodology have improved this issue. The 2000 data was a beta-test of the methodology and is not comparable to the 2005 and 2010 data because of a different sampling methodology. Visitation in this survey is measures in site visits which are "the entry of one person onto a national forest site or area to participate in recreation activities for an unspecified period of time" and national forest visits which can be composed of multiple site visits. The NVUM does not identify the type of recreation preferred by visitors or track how visitors whose desired activities is not offered are displaced. It only captures the activities of the person surveyed during the particular National forest visit being counted (USDA Forest Service 2011a).

The National Survey on Recreation and the Environment (NSRE) is a general population telephone survey of people age 16 and older. It focuses on outdoor recreation activities wherever they may occur, not just those in the national forest or grassland. The value of this information lies in the insights it provides into overall population demand for outdoor recreation. Population-wide demands can represent broad interests, which a national forest or grassland might serve. The data shows an outdoor recreation "participation rate", which is the proportion of people 16 or older living in the local area counties who indicated in the survey that they had participated in an outdoor activity 1 or more times during the past 12 months (USDA Forest Service 2002).

INFRA is the corporate Forest Service Database that tracks data on infrastructure and permits. This database is continuously updated and so the data pulled from day-to-day may be different. INFRA data used in this report has been saved in the project record so as to freeze the raw data that was used to support analysis and effects statements. There may be data flaws associated with the databases in INFRA depending on how well the data has been maintained and how the data entered was collected.

Assumptions for Recreation

In the analysis for this resource, the following additional assumptions have been made:

- Recreation demand is generated by population changes and economic conditions more strongly than by plan direction (Cordell et al. 1999).
- The budget for constructing and maintaining developed recreation facilities will be flat to decreasing in the future, except in areas that have been converted to fee sites or concessionaire contracts.
- The amount of road construction under each alternative will be dependent on-site-specific needs for future projects.
- Most of the roads within areas designated not suitable for public and administrative access roads will be closed over the life of the plan but there will be some exceptions based on the need for main road access and access to private land.

Special Areas

Wilderness Areas

Methodologies used for potential wilderness areas can be found in the Coconino National Forest Wilderness Need Evaluation and the Potential Wilderness Evaluation Inventory and Capability Results reports. These wilderness-related documents may be found at the following Web site: http://go.usa.gov/jHnY.

Wild and Scenic Rivers

Methodologies used for potential wild and scenic rivers can be found in the Coconino National Forest Eligibility and Classification for Wild, Scenic, and Recreational River Designations reports. These wild and scenic river-related documents may be found at the following Web site: http://go.usa.gov/jHnY.

Research Natural Areas

Methodologies used for proposed research natural areas can be found in the Coconino National Forest Research Natural Area Evaluation Report. Additional documents related to research natural areas may be found at the following Web site: http://go.usa.gov/jHnY.

Geological and Botanical Areas

The analysis focuses on an existing designated geological area (GA) on the forest, Red Mountain Volcanic GA, and a proposed geological and botanical area, the Cottonwood Basin Fumaroles Geological Area.[23] These areas are described using information from available literature and from field visits conducted at the Cottonwood Basin Fumaroles GA over the period 2006 to present. The geologic history of these areas is described within this information as well as the scientific and research interest and significance. Management concerns were also identified.

The alternatives are compared on the basis of how they would protect and preserve the geologic features and conserve the scientific values of these areas. The alternatives were also compared for the potential resource impacts that may result from mechanized recreation (e.g., bicycle use) on designated trails in geological and botanical areas. This was a qualitative analysis.

Since the land management plan provides a programmatic framework that guides site-specific actions but does not authorize, fund or carry out any project activity, there are implications or longer term environmental consequences of managing the forest under this programmatic framework. Thus, the focus of this environmental analysis is on the consequences of the alternatives on the desired conditions for the geological and botanical area resources.

Assumptions for Geological and Botanical Areas

In the analysis for geological areas, additional assumptions have been made:

[23] The Cottonwood Basin Fumaroles GA is proposed as a geological area in alternative B, and it is proposed as a much larger geologic and botanical area in alternative C.

- Management plans will be developed as directed by the designated line officer with the appropriate NEPA process once new geological or botanical areas are authorized under the revised plan.

Scenic Resources

In 1987, when the Coconino NF plan was adopted, scenic resources were inventoried and analyzed using the visual management system as outlined in Forest Service Handbook 462 (USDA Forest Service 1974). This system, which was released in 1974, established standards of measurement (i.e., visual quality objectives) for assessing proposed and existing impact to scenic quality.

In 1995, after 20 years of experience with the visual management system and after additional research in the public and private sectors, the Forest Service revised the visual management system and replaced it with the scenery management system. This revised system is described in Agricultural Handbook 701, Landscape Aesthetics: A Handbook for Scenery Management (USDA Forest Service 1995a). The scenery management system was used in combination with the visual management system in this analysis because the scenery management system will not fully replace the visual management system on the Coconino NF until the revised Forest Plan is adopted.

Although the visual management system and scenery management system both manage scenic resources, differences between the systems exist. Most concepts are the same in both systems, but often terminology has changed. Both systems establish objectives (visual quality objectives or scenic integrity objectives) to measure the degree of alteration or deviation permissible in a landscape. The definitions for these objectives are similar, but application is slightly different.

The visual management system measures alterations in terms of the degree of acceptable alteration of the characteristic landscape where any human alterations or changes in the landscape would be considered negative. The visual management system handbook also establishes durations of impact for visual quality objectives: retention should be accomplished during project operation or immediately after project completion; partial retention should be accomplished as soon after project completion as possible or at a minimum within the first year; modification should be accomplished in the first year; and maximum modification within 5 years (USDA Forest Service 1974).

The scenery management system measures deviations from the existing landscape character, and ecosystems provide the environmental context for the scenery management system. With ecosystems providing the context, no specific duration of scenic impacts are assigned to a scenic integrity objective, but rather the focus is on movement toward the desired landscape character (USDA Forest Service 1995a, p. 20). It should be noted that although specific timeframes are not assigned in the SMS Handbook, duration of impacts are always considered in site-specific project planning and analysis with the direct intent to provide high quality scenery and achieve the highest scenic integrity possible (USDA Forest Service 1995a, p. 5-9). The scenery management system also recognizes positive cultural landscapes or cultural scenic attributes where some human alterations have become accepted over time to become expected images or valued features in the landscape contributing to high-quality scenery. The scenery management system also places emphasis on constituent analysis which is discussed in more detail later in this report.

The scenery management system, as outlined in Agricultural Handbook 701, is today's best science to achieve high-quality scenery as an outcome of National Forest ecosystem management practices. Scenery management system inventories were completed for the Coconino NF as part of the land and resource management plan revision process.

ArcMap and geographic information system (GIS) data layers were used to analyze current forest plan direction for scenic resources (referred to in the current forest plan as visual resources), inventory scenic resources as outlined in the scenery management system to determine the existing condition of scenic resources, develop scenic integrity objectives for the action alternatives, and analyze the alternatives in regards to desired conditions for scenic resources (i.e., visual quality objectives or scenic integrity objectives). Scenery inventories were completed through site visits to various parts of the forest, interdisciplinary meetings with forest personnel, review of photos of the forest, use and interpretation of GIS data to develop data layers for all scenery inventories, and review and analysis of research and similar projects.

This analysis will provide key findings of the scenery inventory process to describe the existing condition of scenic resources. The scenery inventory process is fully documented in the Scenery Management System Inventory Report for the Coconino National Forest Land and Resource Management Plan Revision (SMS Inventory Report) (USDA Forest Service 2011c).

The effects analysis will consider how each alternative manages scenic resources by considering the goals, objectives, standards, and guidelines in each alternative for the management of scenery and the amount of each visual quality objective established or scenic integrity objective proposed on National Forest System lands in each alternative. To ensure clarity, the following cross walk between visual quality objectives and scenic integrity objectives is provided (table 31).

Table 31. Scenic integrity, visual quality objective, and perception crosswalk (USDA Forest Service 1995a, p. 2-4)

Scenic Integrity (Existing and Objective)	Visual Quality Objective	The Forest's Scenic Integrity as People Perceive It
Very High	Preservation	Unaltered; landscape character is intact
High	Retention	Appears unaltered; deviations to landscape character are not evident
Moderate	Partial Retention	Slightly altered; deviations are subordinate to landscape character being viewed
Low	Modification	Moderately altered; deviations begin to dominate the valued landscape character being viewed
Very Low	Maximum Modification	Appears heavily altered; deviations may strongly dominate the valued landscape character.
Unacceptably Low	Unacceptable Modification	Appears extremely altered; this level is only used to inventory existing scenic integrity. It is never an objective on National Forest System lands

The effects analysis will also consider how each alternative provides for management of natural-appearing scenery and desired landscape character. Desired landscape character is expressed

through landscape character goals and may be referred to as either desired landscape character or landscape character goals.

The very high, high, and moderate scenic integrity objectives result in a relatively natural-appearing landscape. It is important for National Forests to manage scenery at this level. "Research has shown that high-quality scenery, especially that related to natural-appearing forests, enhances people's lives and benefits society" (USDA Forest Service 1995a, p. 17). It should also be noted that according to "Floyd Newby's findings that "people expect to see natural or natural-appearing scenery," (quoted in USDA Forest Service 1995a, p. 2-3). Furthermore, "research shows that there is a high degree of public agreement regarding scenic preferences. This research indicates that people value most highly the more visually attractive and natural-appearing landscapes" (USDA Forest Service 1995a, p.30).

Gobster (1994) summarizes preferred scenic settings as having four common attributes: large trees; smooth, herbaceous ground cover; an open mid-story canopy with high visual penetration; and vistas with distant views and high topographic relief. Visual access, or how far one can see into a forest, is also a preferred scenic setting (Ryan 2005). In the long-term, when these scenic preferences are part of the desired landscape character, scenic resources will have higher scenic quality if visual access is achieved or enhanced.

The 1992 visual quality objectives (VQOs) GIS corporate data layer (VQO GIS data layer) was reviewed as part of this analysis Two errors were found and corrected in order to accurately compare the VQO GIS data layer with SMS GIS inventories and proposed scenic integrity objectives (Dechter and Minor, personal communication). Even with these corrections, the VQO GIS data layer did not always have a direct correlation to SMS inventories due to differences in handbook direction and how these inventories were completed. For example, the SMS inventories were completed for all forest lands, while VQO GIS data layer did not include full VMS inventory mapping in designated wilderness areas.

Methodology in Mapping Scenery Management System Components

As part of the plan revision process, the Coconino NF inventoried scenic resources using the scenery management system. When completing the scenery inventories, inventories from the visual management system, when available or relevant, were used as a starting point. For more detailed information on the development of the scenery inventories and GIS analysis methods used, the reader is referred to the SMS Inventory Report (USDA Forest Service 2011c).

The scenery management system process involves identifying scenic components as they relate to people, mapping these components and assigning a value for aesthetics. These maps provided information to the planning team to assist them in making a decision relative to scenery as a part of ecosystems and in determining the tradeoffs related to forest plan management scenarios.

Landscape Visibility and Concern Levels

Landscape visibility is composed of two parts: human values as they relate to the relative importance to the public of various scenes (concern levels) and the relative sensitivity of scenes based on distance from an observer (seen areas and distance zones).

Human values that affect perceptions of landscapes are derived from constituent analysis. Constituent analysis serves as a guide to perceptions of attractiveness, helps identify special

places, and helps to define the meaning people give to the landscape. The constituent analysis for the Coconino NF involved the following: reviewing and incorporating key direction from Sedona-Oak Creek Ecosystem (Amendment 12) and the Flagstaff/Lake Mary Ecosystem Analysis (Amendment 17) as these amendment were developed through extensive public involvement; reviewing requests for special area designations made by the public; reviewing SMS inventories in interdisciplinary workshops; reviewing SMS inventories, particularly the proposed SIOs during the March public meetings; and having the SMS inventories available for review during the February/March "office hour" sessions.

Constituent analysis leads to a determination of the relative importance of aesthetics to the public. This importance is expressed as a concern level. Sites, travel ways, special places and other areas are assigned a concern level value of 1, 2, or 3 to reflect the relative high, medium, or low importance.

The Forest Social Science Analyst along with the forest and District Landscape Architects interviewed the district recreation staffs and identified concern levels for the forest's travel routes and use areas. Routes identified as dispersed camping corridors in the Travel Management process were also reviewed as a proxy to determine where people desire to go car camping. The road, trail, and stream systems of the forest were rated as a concern level 1, 2, or 3, primary, secondary, and secondary with low use and moderate to low interest in scenery respectively, as defined in the SMS handbook. All recreation use areas on the Coconino NF were assigned concern level 1 and are shown on the concern level map as use points. This system was also applied to travelways outside of the forest that can see into the forest. A map of concern levels can be found in Appendix A of this report, displaying the concern level travelways and use points identified for the Coconino NF.

Seen areas and distance zones are mapped from concern levels to determine the relative sensitivity of scenes based on their distance from an observer. These distance zones are identified as:

- Foreground – up to one-half from observer
- Middleground – one-half mile to 4 miles from the observer
- Background – 4 miles from the observer to the horizon

The visibility analysis was generated in ArcInfo GIS, using the concern level data layers. Viewpoints were generated at roughly one-quarter mile intervals for concern level 1 roads, trails, and streams and roughly one-quarter mile intervals for concern level 2 roads and trails. A viewpoint layer of concern level use points, which included points not generated from the travel route intervals, was also used to determine seen areas. These use points included overlooks, developed recreations areas, lookouts, and points identified by forest personnel for key views. The visibility analysis was completed for concern levels 1 and 2 only since areas seen by concern levels 1 and 2 would override most areas seen by concern level 3.

The viewpoints were analyzed in combination with the 30-meter digital elevation models (DEM) of the forest. The DEM was processed in GIS to run the visibility commands. Only the topographical/elevation information was used to determine seen areas. Vegetation was not considered in this analysis, because vegetation, being dynamic, may change over time due to natural disturbance or human activity. Vegetative screening is important for short-term detailed

planning at the project-level. However, vegetative screening is inappropriate to consider in long-term, broad-scale planning, such as forest planning (USDA Forest Service 1995a, p. 4-5). A background viewing distance of 4 to 15 miles was used for this analysis since little detail is discernible beyond 15 miles. When an area was assigned to more than one distance zone, the distance zone reflecting the highest concern level use point or travelway was assigned, according to the matrix outlined in the SMS handbook (USDA Forest Service 1995a, p. 4-12).

Inevitably the visibility computer analysis results in some acres that are "unseen." These areas are referred to in the SMS handbook as seldom seen since they may be seen, at a minimum, from aircraft and an occasional viewer wandering through the forest (USDA Forest Service 1995a, p. 4-11). Seldom seen areas are areas not seen from travel routes or identified use points. These areas are assigned a concern level 1, 2, or 3, based on concern for a specific area and may occur in any distance zone or scenic attractiveness class. A concern level use areas layer, including designated wilderness areas and potential wilderness areas with high capability, was used to determine and assign a concern level to these "unseen" areas. Designated wilderness areas and potential wilderness areas with high capability were assigned concern level 1. All other unseen areas were assigned concern level 2. A map of landscape visibility can be found in appendix A of this DEIS.

Scenic Attractiveness

Scenic attractiveness is the primary indicator of the intrinsic scenic beauty of a landscape and of the positive responses it evokes in people. Scenic attractiveness classes are developed to determine the relative scenic value of lands within a particular landscape character. It helps determine landscapes valued for scenic beauty, based on commonly held perceptions of the beauty of landform, rock form, vegetation pattern, composition, water characteristics, land use patterns, and cultural features. Scenic attractiveness indicates varying levels of long-term beauty of the landscape character, regardless of existing conditions. The three scenic attractiveness classes are: Class A-distinctive; Class B-typical; Class C-indistinctive.

When the 1987 plan was adopted, variety class (a particular level of visual variety or diversity of landscape character) was inventoried as part of the visual management system (USDA Forest Service 1974; USDA Forest Service, 1987a). The variety class inventory is replaced with the scenic attractiveness inventory in the scenery management system.

The scenic attractiveness inventory was derived by updating the VMS variety class inventory completed for the 1987 plan. Data used in this update includes water features of lakes and streams, slope classes, Terrestrial Ecosystem Survey units and vegetative cover types. Wilderness Areas and variety class A and C areas were evaluated for scenic attractiveness and updated to provide the overall scenic attractiveness for the forest. Areas not identified and verified as class A or C, were assigned class B, typical. Several areas on the forest were determined to be distinctive based on their cultural values and historic properties, since they strongly contributed to the character of the landscape. Those areas included Crescent Moon Ranch and lands between the General Crook National Historic Trail and the Mogollon Rim.

The SMS Inventory Report (USDA Forest Service 2011c) provides the detailed process used to evaluate, update, and verify the scenic attractiveness classes for the Coconino NF.

Scenic Classes

All national forest landscapes have value as scenery. Using the data gathered and mapped for scenic attractiveness and landscape visibility, a numerical scenic class value is assigned to forest lands. The ratings 1 to7 indicate the scenic value of landscape areas, irrespective of existing scenic integrity

Scenic classes are determined and mapped by combining the three classes of scenic attractiveness with the distance zone and concern levels of landscape visibility as outlined in the Scenic Class Matrix found in the SMS handbook and shown in table 32.

Table 32. Distance Zones/Seldom Seen and Concern Levels

		Distance Zones/Seldom Seen and Concern Levels							
		Fg1	Mg1	Bg1	Fg2	Mg2	Bg2	ss1	ss2
Scenic Attractiveness	A	1	1	1	2	2	2	1	2
	B	1	2	2	2	3	4	2	3
	C	1	2	3	2	4	5	3	5

Note: Only the portions of the Scenic Class Matrix applicable to the Coconino NF SMS inventory process are shown in this table. For the full Scenic Class matrix see the SMS handbook (USDA Forest Service 1995a, p. 4-16).

Existing Scenic Integrity

Existing scenic integrity (ESI) indicates the degree of intactness and wholeness of the landscape character. Conversely, ESI is a measure of the degree of visible disruption of the landscape character. Disruptions in the landscape character most often come from human alterations to the landscape, such as roads or vegetation management. A landscape with very minimal visual disruption is considered to have high ESI, while landscapes with more noticeable disruptions are viewed as having lower ESI. Existing scenic integrity is expressed and mapped in terms of very high, high, moderate, low, very low, and unacceptably low.

Existing scenic integrity levels were determined for the Coconino NF landscapes using GIS data layers. Activities altering the landscape that were used include: utility corridors, travel management, and livestock grazing activities. Other GIS data used includes: designated wilderness areas, potential wilderness areas, roadless inventory, Recreation Opportunity Spectrum, wildland fire, and insect and disease outbreaks. NAIP (National Agricultural Imagery Program) aerial imagery from 2008 was used as a reference (at a general scale of 1:24,000) to identify changes in the landscape that may not be found in the available GIS data layers and may be noticeable from aerial views. Due to time constraints which limited field review, most ESI levels were rated from an aerial view, which is consistent with SMS Handbook direction (USDA Forest Service 1995a, p. 2-6). Activities and lands in other ownerships were not reviewed or rated in detail but were generally rated the same as adjacent forest lands.

This report provides a summary of the existing scenic integrity inventory. The SMS Inventory Report (USDA Forest Service 2011c) provides the detailed process used to determine and rate existing scenic integrity for the Coconino NF.

Proposed Scenic Integrity Objective Development Process

Scenic Integrity Levels are discussed and proposed for all National Forest System lands acres during the forest planning process using the information in the scenery inventories as guidance. Once a final plan alternative is adopted, the Scenic Integrity Levels become Scenic Integrity Objectives (SIOs) which are then used to manage the scenery resource (USDA Forest Service 1995a, p. 4-16). SIOs become part of the new plan and along with the desired landscape character provide a system to support future improvements to and maintenance of scenic resources.

For clarity and to reduce confusion with existing scenic integrity levels, the planning team opted to use the term proposed SIOs during the forest planning process for all action alternatives. To help determine proposed SIOs, a composite scenery base map was produced by combining scenic classes and existing scenic integrity levels. This map was used as a starting point for determining proposed SIOs during the interdisciplinary forest planning process. The mapping process is fully discussed in the SMS Inventory Report (USDA Forest Service 2011c).

Proposed SIOs were initially determined regardless of the theme or focus of any proposed management areas. The desired condition of scenery for the area was the main consideration. An interdisciplinary team reviewed the proposed SIOs in two meetings and made refinements based on local knowledge and expertise. The refinements made to determine the proposed SIOs are documented in meeting notes from forest planning meetings. Further refinements to proposed SIOs were made throughout the forest planning process using the proposed management areas, information gathered during the March public meetings, and input from the extended forest planning interdisciplinary team. Proposed SIOs of adjacent forests were reviewed to ensure as much consistency as possible of SIO allocation across forest boundaries. A map of proposed SIOs for alternative B can be found in appendix A of this DEIS.

Scenery Rehabilitation Development Process

To develop a scenery rehabilitation map, the existing condition of scenic integrity (existing scenic integrity inventory) and desired condition of scenic integrity (proposed SIOs) were compared to see where the existing scenic integrity condition is currently lower than the desired condition for scenic integrity. For example, areas with moderate existing scenic integrity, but a high SIO, are shown on the scenery rehabilitation map as rehabilitate by one level. In some cases, a deviation of three levels may occur (i.e., areas with an existing scenic integrity of very low, but a high SIO). Management activities identified to rehabilitate scenery are anticipated to be able to improve scenic integrity by one level on a site-specific basis during the life of the plan. Areas identified to be rehabilitated by more than two levels may not realize the overall desired scenic integrity for several planning cycles.

Assumptions for Scenic Resources

In the analysis for this resource, the following additional assumptions have been made:

- The principles of scenery management and environmental design will be applied in project-level planning in all National Forest System activities.
- Scenery management techniques and principles will be used to mitigate any future site-specific land altering activity or introduced elements on the land, to achieve and maintain desired scenic integrity objectives and landscape character goals.

- Scenery management accomplishments and success of mitigation measures in meeting scenic integrity objectives will be measured. Monitoring will be conducted to determine how projects and programs are affecting scenery.
- Changes in scenery and changes in public expectations related to landscape aesthetics and scenery will be monitored and documented (FSM 2382 – Scenery Management). Changes in public expectations related to landscape aesthetics and scenery would most likely be monitored at a regional or national level, but may also be assessed during scoping for site-specific projects and review of current research when completing scenery analyses for site-specific projects.

Scenery inventory GIS data layers will be reviewed during future project-level analysis and updated as ground-truth activities occur to keep the data layers accurate and relevant.

Community-Forest Interaction

Minerals and Energy

Scope of Analysis and Data Sources

The following dataset information sources were reviewed for information on past, potential and active mineral uses and resources across the Coconino NF. Although data quality is discussed, the overall uncertainty of data and information presented here is very low. All data was derived from agency and professional reports and databases.

Mineral uses and resources that were evaluated include: locatable and leasable minerals (geothermal) and common variety mineral materials. More detailed reviews were carried out for each recommended wilderness area, proposed special areas (including geologic and botanical), and research natural areas. Eligible wild and scenic rivers were not reviewed because once established by statute they would be withdrawn from locatable mineral entry. Past, potential, and active mineral uses were also reviewed within areas of very high scenic integrity.

The LR 2000 (#1, #9) is a national database developed by the Bureau of Land Management and is used by agencies and the public. A user can run reports on BLM land and mineral use authorizations for oil, gas, and geothermal leasing, rights-of-ways, coal and other mineral development, land and mineral title, mining claims, withdrawals, classifications, and more on federal lands or on federal mineral estate. The data quality is good.

The Database for Mineral Districts in the State of Arizona (#2) is produced by the Arizona Geological Survey and this GIS coverage and the book reference is widely used by specialists doing mineral reports. The data quality is good and for many mineral districts, there is a reference list which provides further information about the history and production of mineral districts.

The Mineral Resource Appraisal of the Coconino National Forest, Arizona (#3) (Lane 1992) is a study conducted by the U.S. Department of Interior, Bureau of Mines. The Bureau of Mines (BOM) is charged with the collection, analysis, and dissemination of information about mining, mineral resources and mineral processing of the United States and the world. BOM has conducted similar studies of mineral resource potential for many of the national forests in the western United States, and this data is commonly used in mineral reports. The data quality is excellent.

The Minerals Availability System (MAS) was established by BOM in 1975 to ascertain the potential supply of selected mineral commodities. The MAS database describes over 5,000

significant mines, deposits, and minerals processing plants around the world with operation specific feasibility evaluations. The Mineral Industry Location System (MILS), provides location and identification information on about 22,000 (mostly U.S.) mineral sites. The MAS/MILS GIS database on this is the result of the inventorying process (#7, #8). The mineral sites have varying degrees of data quality and location accuracy. The information was compiled from state mineral survey publications and other literature sources going back into the 1800s and continuing to the 1970s. The MAS/MILS database and GIS coverage is commonly used by the Forest Service and Bureau of Land Management in their abandoned/inactive mine surveys and together with the voluminous literature about mines and mining make this a valuable database to survey the mineral potential of an area. The MAS/MILS database GIS coverages are commonly used in mineral reports. The Mineral Favorability database is derived from the MA/MILS database. Overall the data quality is excellent.

The IWEB/INFRA Database for Minerals and Geology (#6) is a Forest Service database used to track sales and free use offerings of mineral materials as well as other mining- related administrative actions. The data quality is good for sales of minerals to the public, but the database does not track Forest Service use or county use of mineral materials very well because information of this use is not always entered in.

The Forest Rock Pit Inventory (USDA Forest Service 1995b) and Coconino-Kaibab Rock Pit NEPA geodatabase (USDA Forest Service 2011b) and Pits shapefile (2005) (#5) are all Coconino National Forest data and inventories. Used together, and with aerial photography, active, inactive, and proposed rocks pits on the forest can be identified. Overall the data quality is good.

Articles on Geothermal Potential of the San Francisco Volcanic Field **(**Duffield et al. 2000; Morgan et al. 2003; and Morgan et al. 2004) (#4) were used to determine the geothermal potential of the San Francisco Volcanic Field. The data quality of their reports is good.

Mineral withdrawal data that was used (#9) came from internal Forest Service files letters, and data, discussions with Linda Fox, the Forest Reality Specialist, and Bureau of Land Management LR2000 information. The data was used to determine the status of existing and expired mineral withdrawals on the forest. The data quality is good.

Using these dataset the evaluation of energy and minerals included the following items:

- How guidance has been updated on appropriate locations for mineral development and associated rehabilitation as well as energy development and associated infrastructure. This is a qualitative analysis.
- The amount (acres) of land currently withdrawn from locatable mineral entry (same for all alternatives)
- The amount (acres) of land that could be recommended to be withdrawn from locatable mineral entry, by alternative and type such as wilderness, special areas etc.
- This analysis also reviewed the proposed wildlife habitat management areas and areas of Very High Scenic Integrity Objectives for mineral resource potential. This was a qualitative analysis.

Assumptions for Minerals and Energy Resources

In the analysis for minerals and energy resources, additional assumptions have been made:

- The forest has the capacity to evaluate process and administer mineral activities.
- The economy will fluctuate and influence mineral exploration.
- Past mineral uses, mining claims and activities provide a useful indication of current and potential future uses and activities on the forest
- New technologies will influence mineral exploration and development.
- There are no known leases on the forest for the following leasable mineral resources: oil and gas, oil shale, coal or geothermal. See the affected environment section for discussions of past leases and current interest.
- The Forest Service would respond as a cooperating agency when requested by the BLM, which is the lead agency for subsurface mineral extraction, including geothermal. Because there are no current leases, the consequences to leasable minerals will not be analyzed in this report.
- Possible mineral and energy resource opportunities lost by existing and recommended wilderness, Wild and Scenic Rivers, and special areas that once designated would likely be withdrawn from mineral entry or could have no leasing stipulations.

Forest Products

The alternatives were compared on the basis of how they would provide forest product resources to the public. This was a qualitative analysis. Related sections and associated methodologies, including Vegetation and Fire and Socio-Economic Analysis sections in the DEIS and information disclosed in appendix G, provide other analysis related to forest products.

Heritage Resources and Tribal Relations

Data Limitations

In order to address the current condition and potential effects of the various plan alternatives on heritage resources, various sources of information and data summaries from the forest's archaeological site and survey files were used. These data summarized the numbers of known sites, archaeological site densities, and cultural sensitivity of different parts of the forest.

Within the exterior boundary of the Coconino NF, site information has been recorded for approximately 10,000 archaeological sites. This includes approximately 787 "Legacy Sites"—early-sites reported prior to 1960 by the Museum of Northern Arizona that have not yet been relocated and re-recorded to current standards; 291 sites on National Park Service land, mostly Walnut Canyon National Monument; 130 sites on private land, 51 sites on county or municipal lands, and approximately 8,741 sites recorded since 1975, when the heritage program of the forest was established.

All sites with confirmed locations are plotted on the forest's GIS map layers with supporting information in a Geodatabase. An Archaeological Site Log spreadsheet has records for approximately 6,500 sites and 9,240 sites are presently entered into INFRA (as of Dec. 7, 2010). There are a number of information systems that today comprise the Archaeological Site Survey of the Coconino NF. Various types of computerized information for roughly 6,000 to 9,000 sites is available and is sufficient to characterize and make reliable conclusions about the nature and condition of archaeological sites on the Coconino NF.

Archaeological Site Density

In order to evaluate the archaeological sensitivity of different parts of the forest, a simple model was developed that predicts the potential number of sites per square mile within different environmental situations as reflected by the 134 soil/moisture/vegetation units defined by the Terrestrial Ecosystem Survey (TES) for the forest. The Terrestrial Ecosystem concept was developed by the Forest Service to characterize the various environmental areas of the forest by considering a number of environmental variables such as geological substrate, slope, aspect, existing vegetation, historical vegetation, moisture, and soil type. All of these variables have been found to be important when considering the relationships between the environment and prehistoric land use patterns.

For purposes of evaluating the potential effects of projects and activities, site sensitivity is defined as the potential site density of the area that could theoretically be impacted by various actions. The potential site density for each of the 134 TES units is determined by dividing the number of sites recorded within each TES unit by the total acres that archaeologists have physically examined within each TES unit. This provides an estimate of the number of sites per acre which, when multiplied by 640 (the number of acres within a square mile), provides the estimated number of sites per square mile within each of the TES units. The estimated site density for each TES unit was plotted as a histogram, ranging from low to high, and by identifying natural breaks in the histogram, five site density classes were defined (table 33).

Ratings of simple site density were modified into areas of cultural sensitivity for areas that are known to be of traditional cultural importance to modern Southwestern American Indian tribes. The degree to which the site sensitivity was upgraded for cultural sensitivity is based upon the relative traditional importance of an area, as understood by the Forest Heritage Resources staff. Hence, the San Francisco Peaks, with their major religious and cultural significance to many tribes, are ranked as extremely high in cultural sensitivity, while the piñon juniper country east of Winona, an important fuelwood and piñon nut gathering area for nearby Navajo chapters, is rated as much lower in cultural sensitivity.

Table 33. Archaeological site density classes defined for the Coconino National Forest

Cultural Sensitivity	Estimated Site Density
Very Low	0 sites/square mile
Low	1 - 10 sites/square mile
Moderate	11 - 20 sites/square mile
High	21 – 30 sites/square mile
Very high	30+ sites/square mile

In general, very low to low density areas correspond with the high ponderosa pine forest above the Mogollon Rim. The ponderosa zone on the east side of the San Francisco Peaks, northeast of Flagstaff, however, is a high site density area. High to very high density areas occur in the piñon juniper zone, particularly in the Verde Valley, along the base of Anderson Mesa, east of Flagstaff, and north of the cinder belt.

Assumptions for Heritage Resources

In the analysis for heritage resources, additional assumptions have been made:

- Analysis and impacts to cultural resources from site-specific actions will be addressed at the time site-specific decisions are made.
- Populations in Arizona will continue to increase, putting further demands on forest resources.

Infrastructure and Facilities

Forest Road System

Information related to the forest road system was obtained from the INFRA Database (I-web), and the Coconino NF Travel Management Rule (TMR) Proposed Alternative 3 roads GIS data. The INFRA Database is the primary Forest Service database that stores many different types of tabular data. GIS and INFRA are linked to ensure consistency of both and are updated continually to reflect actual conditions in the field.

GIS layers delineating new proposed wilderness areas, special interest management areas, and wildlife habitat management areas were used to clip the TMR Proposed Alternative 3 roads data. This provided mileage data for public roads and roads designated "for administrative use only" as per the recent travel management decision.

In addition, analysis was performed in order to determine road mileages by Recreation Opportunity Spectrum (ROS). For the analysis the roads were intersected with the ROS. This analysis allowed for all roads to be associated with their respective ROS class. The mileage was updated to reflect the length segments and the data imported to an excel spreadsheet for further analysis. From here, the data was differentiated by ROS Code and Alt3 Status and the mileages in each category were summed up.

The road mileage by operational maintenance level was obtained from INFRA. This database enables queries to be performed depending on what type of data you need for analysis. For the FPR analysis the most recent Road Core information available was downloaded with an effective date of June 14, 2011. The data was filtered and all of the roads that had the following criteria: Jurisdiction as Forest Service, System, as National Forest Service System Road, and Route Status as existing were selected for analysis. Then, MS Access was used to sort based on operational maintenance levels 1 through 5 and the mileage was summed up for each operational maintenance level. The TMR geospatial layer preferred alternative 3, which was eventually selected as the 2012 Motor Vehicle Use Map (MVUM), was not used to identify NFS system roads because it included several hundred miles of additional roads such as user created roads or roads crossing non forest service land that were not yet incorporated into the INFRA database. The Forest Service Road system is historically defined as roads that exist in INFRA that have these main three criteria listed above so therefore the INFRA data base was used exclusively for the breakdown of the Forest Service Road System. The TMR layer was used to determine which roads were public access and which were admin only from what was available in INFRA. This data will be updated between the Draft and Final EIS to reflect the more recent INFRA database and MVUM.

The methodologies and analysis described above contain two separate data sources that were analyzed. Since the TMR was not yet implemented, INFRA was used to analyze the existing

conditions and Alternative A (No Action). Further analysis was done using TMR current decision road layers to accurately project the effects of the other alternatives (alternatives B-D) on the NFS road system since TMR would be implemented prior to the revised plan.

Administrative Facilities

The analysis of administrative facilities was performed using GIS, facility location data (INFRA), and forest service visitor maps. Proposed special areas and management area guidelines were analyzed for all alternatives. The location of the expansion areas were determined using GIS and then compared with known administrative facility locations in order to determine if any facilities would be affected by the proposed alternatives.

Lands and Special Uses

Various methodologies were used to develop this analysis. Data was obtained through the following resources and databases:

Methodology and analysis process for this report included query of the Infra special uses database (SUDS), use of GIS for inventory and identification of landownership patterns, Forest Service records and case files, and census data to review population trends. SUDS reports of special uses by Township and Range were also used to evaluate possible impacts to existing uses with proposed wilderness and other special areas. In addition, the final rents report was used to determine fee receipts from land and recreation uses.

The INFRA – Special Uses Database (SUDS) was used to determine the type, number, and status of lands special use authorizations. Some use codes were combined into general categories as listed in the Forest Service Handbook 27091.11, Chapter 50 – Terms and conditions use chart. Special use permit numbers were calculated using the status of application approved, pending signature and issued status on June 11, 2011. There may be some inaccuracies in the database, including permits that are expired that are shown as issued and may not be reissued or closed or expired permits that may still have active uses but are currently not authorized or counted. Short-term permits are not separated from longer term permits in this query.

Automated Lands Program (ALP)/Land Status Records System (LSRS) Production geodatabase was used to determine land acreages and changes in landownership since the 1987, including method used. Total Coconino NF acreages were obtained from the land areas of the national forest report[24].

Review of existing private property locations and their locations in relation to proposed wilderness and other special areas was done using Coconino County's GIS mapping program and forest GIS land ownership layers.

Assumptions for Lands and Special Uses

In the analysis for this resource, the following additional assumptions have been made:

[24] http://www.fs.fed.us/land/staff/lar/index.html

- The agency has the capacity to screen, process, and manage special uses, including energy corridors.
- The population of Arizona will continue to grow and be dependent on electricity.
- The economy will fluctuate over time and influence energy corridor development.
- Community and public needs for use of Federal land for services and infrastructure, including roads and energy corridors, will continue.
- Consumers will continue to demand reliable electricity and other utilities.
- It is anticipated that over the life span of the proposed forest plan that there will be a net increase in forest land acreage although at a much smaller scale than in the previous plan's time period.

Livestock Grazing

The alternatives were compared on the basis of how they would affect management of livestock grazing on the forest. This was largely a qualitative analysis for most effects under all alternatives.

Assumptions for Livestock Grazing (Common to All Alternatives)

In the analysis for this resource, the following additional assumptions have been made:

- Market demands for livestock products are highly variable. It is assumed that current market demands for livestock products would continue throughout the next several decades with a continuing demand for grazing of the forest lands.
- Livestock grazing use would be authorized dependent on forage availability
- The Arizona Game and Fish Department manage populations of big game (i.e. mule deer, elk, pronghorn antelope, and bighorn sheep).
- Administrative permittee access will remain consistent with the travel management rule (TMR) decision (USDA Forest Service 2011i).
- Livestock grazing is not authorized in areas already closed to grazing. In addition, plan components would not close pastures or allotments. If a closure is needed to meet plan components, the closure will be identified during site specific NEPA.

Determination of Lands Capable for Livestock Grazing

Capability is the potential of an area of land to produce resources and supply goods and services. Capability depends upon current conditions and site conditions such as climate, slope, landform, soils, and geology. These have not changed significantly since the evaluation done for the 1987 plan.

For the 2011 analysis, more recent terrestrial ecosystem survey (TES) information was used. Three measures were used to determine capability: (1) slopes steeper than 40 percent, (2) inherently unstable soils, and (3) forage productivity. Forage productivity was taken from TES map unit classifications across the forest using corporate geographic information science (GIS) data. Inherently unstable soils are described for appropriate map units in TES documentation (USDA Forest Service 1995c). Inherently unstable soils are those that cannot support sufficient vegetation cover to slow erosion processes, even with management intervention. Slopes were determined from U.S. Geological Survey (USGS) information.

Comparison with capable lands shown in table 34 of this appendix shows an approximate 5 percent difference between capability determined in 1987 and a re-evaluation of capability conducted as part of this plan revision process. This table represents an estimation of capability using coarse data appropriate for landscape level analysis. More precise information would be reviewed when site-specific environmental analysis is conducted, which could produce different results at the project level.

Table 34. Results of the 2011 Grazing Capability Analysis

Characteristic	Acres	Notes	Source
Coconino NF (total area)	1,837,498	Forest plan analysis area	
Slopes >40%[1]	-184,102	Private land not included.	USGS national elevation dataset at 10 meter resolution (USGS, 2006)
Soils that are Inherently Unstable[1, 2]	-208,935	Private land not included.	Terrestrial Ecosystem Survey Map Unit descriptions
Potential forage productivity <100 lbs./ac-yr.[1]	-135,088	Private land not included.	Terrestrial Ecosystem Survey Map Unit classifications.
Potentially capable lands	1,320,096	This area is about 5 percent less (61,123 acres) than the pre-GIS calculation in the 1982 Analysis of the Management Situation (USDA Forest Service 1982a).	

[1] Slopes greater than 40 percent, soils that are inherently unstable, and areas with potential forage production less than 100 pounds per acre per year are estimates and may have overlap between categories resulting in some acres being counted multiple times.

[2] This classification is displayed in TES under Landscape features and is an interpretation based on climate, soils, rock features, and slopes. It indicates conditions where annual soil renewability is less than soil loss under natural conditions described in Potential Plant Community in the TES document. Therefore, retention of vegetative cover may not slow erosion or soil creep processes even with management intervention such as seeding.

Determination of Lands Suitable for Livestock Grazing

Procedures in the 1982 planning rule require that grazing suitability be determined in forest planning. Suitability is the appropriateness of applying certain resource management practices to a particular area of land in consideration of the relevant social, economic, and ecological factors. Suitability is the appropriateness of applying certain resource management practices to a particular area of land in consideration of the relevant social, economic, and ecological factors. A unit of land may be suitable for a variety of individual or combined management practices. Lands identified as suitable for livestock grazing indicates that grazing is compatible with the desired conditions and objectives in the plan area. The identification of lands suitable for livestock grazing within a revised plan is not a decision to authorize livestock grazing: Suitability of land uses is a broad scale identification and is not appropriate for site-specific problem solving. Scale of suitability identification is the same as desired condition and objective descriptions. Final decisions to authorize livestock grazing are made at the project (allotment) level.

The grazing suitability analysis began in early stages of this plan revision effort using a process provided by the Southwestern Region (USDA Forest Service, 2010b). In accordance with that

direction, a comprehensive review of grazing suitability was conducted. The grazing suitability review was divided into three segments: suitability determinations made prior to the 1987 plan, suitability determinations made by the 1987 plan, and suitability determinations made since the implementation of the 1987 plan. Incorporating these segments together provides a complete picture of the remaining lands on the forest that are suitable for livestock grazing.

The grazing suitability review identified allotments and portions of allotments that were closed prior to 1987 (prior to the implementation of the 1987 plan). These areas have remained closed over the life of the 1987 plan. These areas were closed for a variety of reasons and the suitability review did not identify any reasons to revisit the closures at this time.

The closed or partially closed allotments include:

- Allotments closed prior to 1987 (Camp Verde, Middle Verde, Montezuma, Rimrock, Cave Hill, Dry Creek);
- Portions of allotments closed prior to 1987 (Cottonwood, Cinder, Turkey Tanks, Deadman, Dove Tanks, Frisco Mountain, Hart Prairie, Tom's Creek, Indian Gardens, and Oak Creek);

Because the 1987 plan does not specifically mention grazing suitability, the grazing suitability analysis begun in 2010 initially equated the plan language of "grazing capacity" with grazing suitability. After closer scrutiny in 2013, that approach was abandoned and replaced with a thorough review of the language in the plan associated with livestock grazing. Where the language in the plan indicated that livestock grazing was not compatible with the desired conditions for a particular area, that area was identified as not suitable for livestock grazing. Examples of language from the plan that indicate an area is not suitable for grazing include "closed to grazing," "exclude grazing," and "prohibit livestock grazing." The lands that are not suitable for livestock grazing according to the 1987 plan include:

- Strawberry Crater Wilderness (USDA Forest Service 1987a. p. 110);
- Tundra and upper mixed conifer/spruce-fir slopes25 within the Kachina Peaks Wilderness (USDA Forest Service 1987a. p. 110);
- Stoneman Lake basin (USDA Forest Service 1987a. p. 175);
- Cinder Hills OHV Area (USDA Forest Service 1987a. replacement p. 182);
- Oak Creek Canyon (formerly Management Area 14) (USDA Forest Service 1987a. p. 187);

[25] The plan does not specifically define the terminology "tundra and upper mixed conifer/spruce-fir slopes." However, the interdisciplinary team (IDT) reviewed this terminology in the context of the 1987 plan to determine its intent. During this review, the IDT recognized that at approximately 9,500 feet elevation in this area, there is an obvious change in the topography; the slopes begin to get prohibitively steep for livestock grazing. The IDT also recognized that the higher elevations in this wilderness contain sensitive habitat for a threatened plant species. The land above 9,500 feet elevation includes all of the known and potential habitat for this species. Finally, the waterline road in this area generally traverses the hillside at around 9,500 feet elevation, providing a recognizable, on-the-ground boundary. For these reasons, the IDT concluded that this terminology applied to lands in the Kachina Peaks Wilderness above 9,500 feet in elevation.

- Developed recreation sites and Snow Bowl special-use authorization area (USDA Forest Service 1987a. p. 190);
- Inner Basin (formerly Management Area 16) (USDA Forest Service 1987a. replacement p. 192);
- Oak Creek Canyon Research Natural Area (USDA Forest Service 1987a. new p. 196-1);
- Casner Research Natural Area (USDA Forest Service 1987a. new p. 196-1);
- Elden Environmental Study Area (USDA Forest Service 1987a. replacement p. 199);
- Old Cave Crater Environmental Study Area (USDA Forest Service 1987a. replacement p. 199);
- Griffith's Spring Environmental Study Area (USDA Forest Service 1987a. replacement p. 199);
- Right-of-way in the Highway 180 Travel Corridor (USDA Forest Service 1987a. new p. 206-4).

The final step of the comprehensive review of suitability for livestock grazing was reviewing decisions that have affected livestock grazing on the forest. This review identified the decision for the Verde River Comprehensive River Management Plan that excludes livestock grazing from portions of the Verde Wild and Scenic River corridor. This review also identified three grazing decisions that removed grazing from three allotments and two grazing decisions that closed portions of two allotments to grazing. Based on these decisions, the following areas have been identified as not suitable for livestock grazing:

- Horse Mesa, Boynton Canyon, and Sedona allotments (based on the decisions signed on September 26, 1997, March 1, 2000, and July 1, 1998, respectively);
- Portions of the Buck Springs Allotment (as described in the decision signed on August 18, 2003);
- Riparian habitat in the Verde Wild and Scenic River corridor, unless site-specific NEPA analysis approved by the forest supervisor authorizes future grazing use (Verde Wild and Scenic River Comprehensive River Management Plan, signed on June 14, 2004. p. 20);
- South Newman, Walnut, and West Walnut Pastures in the Walnut Canyon Allotment (based on the decision signed on July 28, 2006).

The Beaverhead-Grief Hill sheep driveway overlaps some of the areas listed above as not suitable for livestock grazing, including but not limited to, the former Montezuma and Horse Mesa grazing allotments. This multi-forest sheep driveway provides temporary use to seasonally move sheep from lower elevations on the Prescott NF to higher elevation summer range on the Coconino and Kaibab NFs. This driveway remains suitable for livestock grazing associated with the temporary, seasonal use by domestic sheep herds.

As the summary of lands identified as not suitable for livestock grazing above reflects, livestock grazing suitability has been an ongoing process for decades. Adjustments have been made as needed over that time period resulting in the current list of lands that have been identified as not suitable for livestock grazing. Considered together, the lands that were identified as not suitable for livestock grazing by the 1987 plan and the time periods before and after its implementation provide an accurate identification of lands not suitable for livestock grazing at this time. The grazing suitability review did not indicate any need to change the current identification of areas

not suitable for livestock grazing. The remaining areas on the forest (those not listed above as not suitable for livestock grazing) are being identified as suitable for livestock grazing.

Socioeconomic Analysis

Data Sources

Economic impacts were modeled using IMpact Analysis for PLANning Professional Version 3.0 (IMPLAN) and the Forest Economic Analysis Spreadsheet Tool (FEAST), with 2009 data. Data on use levels under each alternative were collected from the Coconino NF's resource specialists. In most instances, the precise change is unknown. Therefore, the changes are based on the professional expertise of the resource specialists (1982 rule, 219.12(g)).

The IMPLAN input-output modeling system and 2007 IMPLAN data (the most recent data available) were used to develop the input-output model for this analysis (IMPLAN Professional 2004). IMPLAN translates changes in final demand for goods and services into resulting changes in economic effects, such as labor income and employment of the affected area's economy. For the economic impact area, employment and labor income estimates that were attributable to use of forest resources for the Coconino NF were generated.

The IMPLAN model is valuable because it captures the direct, indirect, and induced effects resulting from a change in demand. IMPLAN is an input-output model, which depends on the inputs of spending profiles and industry sector data. It then outputs a 'response coefficient', which captures the employment response from the effect of a specified demand for goods or services.

The response coefficients, as well as baseline economic data, were exported from IMPLAN models and read into FEAST, a spreadsheet designed to pair IMPLAN response coefficients with resource data to generate an economic contribution report.

Financial efficiency analysis was conducted with QuickSilver Version 6. Data on program expenditures and revenues were provided by the Coconino NF resource specialists and budget staff (1982 rule, 219.12(e)).

Social impacts used baseline social conditions, NVUM visitor profiles (USDA Forest Service 2011a), and information from the Economic and Social Sustainability Assessment (USDA Forest Service 2008b) to discern the primary values that the Coconino NF provide to area residents and visitors. Social effects are based on the interaction of the identified values with estimated changes to resource availability and uses.

Assumptions for Socioeconomic Resources

In the analysis for these resources, the following additional assumptions have been made:

- Information on the timing of costs and benefits was not available for the economic efficiency analysis. Furthermore, the analysis does not provide a full accounting of all costs and benefits. The only benefits considered are program revenues (i.e., forest receipts). The only costs considered are direct Coconino NF expenditures.
- The economic impact of grazing was estimated using authorized levels. However, actual use is permitted annually based on a number of factors, such as current forage and market conditions. For consistency, the analysis assumes that current market demand for

livestock products would continue throughout the next several decades with a continuing demand for grazing of the forest lands.

- Changes in use levels were estimated using professional judgment. However, actual changes in use are difficult to predict. Only minor changes in expected resource use levels and activities were predicated between alternatives.
- Some of the value of forest management is not captured in market transactions. Non-market goods and services, such as clean air and scenic vistas, have economic values. However, the monetary values of such goods and services are generally unknown. As a result, it is difficult to analyze potential tradeoffs between market and non-market values. In general, management actions that promote forest health will increase non-market values. For the purpose of this analysis, lands with wilderness-related values will be used as a proxy for non-market values.
- The framework for the social analysis employs generalities. Area residents and Coconino NF visitors have diverse preferences and values that may not be fully captured in the description of social consequences. Nevertheless, the general categories are useful for assessing social impacts based on particular forest-related interests.

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Appendix D. Response to Comments

Appendix D will be developed for the final environmental impact statement in response to comments received on the draft environmental impact statement during the 90-day comment period.

Appendix E. Other 1982 Planning Rule Provisions

Introduction

This appendix fulfills the remaining 1982 planning rule provisions and other planning related requirements that are not satisfied in the main body of the DEIS: benchmark analysis and financial evaluation.

Benchmarks Analysis Report for the Revision of the Coconino National Forest Plan

Information prepared by Jim Beard, Carol Boyd, Heather Green, Kim Newbauer, Christine Paulu, and Rory Steinke of the Coconino NF (March 2010). Information updated by Sara Dechter, Kim Newbauer, and Shawn Martin of the Coconino NF (October 2011).

Introduction

Benchmark data from the 1987 Coconino NF plan (the 1987 plan) and 1987 final environmental impact statement (EIS) for the Coconino NF plan was reviewed during plan revision to determine if there was a need to change any previously established benchmarks.[26] Benchmarks set the threshold for alternative development decision space, particularly the upper end. In the 1987 plan EIS, alternatives were output-driven and influenced by the ability of the forest to provide goods and services. Results of this review should not be interpreted to suggest that the forest will revert to outdated language such as board feet instead of cubic feet nor is the forest intending to pursue a maximum output related alternative such as maximum timber. The forest is intending to revise the plan with a focus on outcomes. Consequently, in the proposed revised plan, desired conditions will be emphasized instead of desired amounts of goods or services.

This review is being done because the forest has elected to use the provisions of the 1982 planning rule to complete its plan revision. Benchmark analysis is a required part of those provisions pertaining to the "Analysis of the Management Situation." If, in the process of alternative development, it is discovered that an alternative falls outside the range of an existing benchmark, then the affected benchmark will need to be reevaluated and reestablished as necessary.

Summary for Setting Plan Benchmarks

In the 1987 plan EIS, the forest established 11 economic benchmarks to set a minimum and maximum range for outputs for the development of alternatives:

- Sawtimber – thousand board feet (MBF) and hundred cubic feet (CCF)
- Net merchantable timber – hundred cubic feet (CCF)
- Timber products – thousand board feet (MBF) and hundred cubic feet (CCF)
- Firewood – thousand cords (Mcords) and hundred cubic feet (CCF)

[26] See pages 341-371 in the 1987 plan DEIS (USDA Forest Service 1987b).

- Grazing capacity – thousand animal unit months (MAUM)
- Permitted Livestock Use – thousand animal unit months (MAUM)
- Wilderness Recreation – thousand recreation visitor days (MRVD)
- Developed Recreation – thousand recreation visitor days (MRVD)
- Dispersed Recreation – thousand recreation visitor days (MRVD)
- Wildlife Recreation – thousand wildlife and fish user days (MWFUD)
- Water Yield – thousand acre feet (MacFt)

Of these 11, 8 are deemed adequate to set the range of the alternatives that may be developed as part of Coconino NF plan revision and 3 require modification, because they exceed or fall below previously established benchmarks or are accounted for within another benchmark (see table 1). Methods used to review the benchmarks are described following table 1.

Wilderness recreation MRVDs exceed the previously established maximum benchmark according to National Visitor Use Monitoring (NVUM) from 2005. The previous benchmark was based on the projected use and past history of uses. Developed recreation MRVDs fall below the previously established minimum benchmark. The previous benchmark was based on past history of uses and the assumption that demand would increase proportional to Arizona's population increase. Wildlife and fish user day benchmark was grouped with dispersed recreation. The 2005 NVUM was used for recreation data, which did not discriminate between wildlife-based and other types of recreation. For plan revision, dispersed recreation was considered to include wildlife-related activities.

Table 1compares previously developed benchmarks to estimates of future expected outputs under current management. All previously established benchmarks are assumed to be valid except for modified benchmarks which are indicated in bold font.

Table 1. Comparison of past benchmarks to estimates of future expected outputs

Benchmark	Range	Benchmark Projections[1] of Average Annual Output by Time Period		Estimated Average Outputs Using Current Data	
		Period 3 2001-2010	Period 4 2011-2020	Period 3	Period 4
Sawtimber MBF/CCF	Minimum	0	0		
	Maximum	147,943/ 227,832	157,704/ 242,864	5,181/ 7,979	49,524/ 76,267
Net Merchantable Timber CCF	Minimum	0	0		
	Maximum	298,010	343,870	16,390	247,610
Timber Products MBF/CCF	Minimum	0	0		
	Maximum	42,848/ 58,359	75,012/ 102,166	2,833/ 3,858	14,851/ 20,227

Benchmark	Range	Benchmark Projections[1] of Average Annual Output by Time Period		Estimated Average Outputs Using Current Data	
		Period 3 2001-2010	Period 4 2011-2020	Period 3	Period 4
Firewood cords/CCF	Minimum	0	0		
	Maximum	111,740/ 87,939	78,088/ 61,455	14,866/ 11,700	27,954/ 22,000
Grazing Capacity MAUM	Minimum	0	0		
	Maximum	378	391	Assumed within previous benchmark[2]	Assumed within previous benchmark
Permitted Livestock Use MAUM	Minimum	0	0		
	Maximum	358	378	153	Assumed within previous benchmark
Wilderness Recreation MRVD	Minimum	0	0		
	Maximum	60	88	97	123
Developed Recreation MRVD	Minimum	1,010	1,035		
	Maximum	2,460	1,708	857 (<previous min. benchmark)	1,185
Dispersed Recreation MRVD	Minimum	230	275		
	Maximum	2,128	2,422	1,717	2,375
Wildlife Recreation MWFUD	Minimum	162	142		
	Maximum	308	317	Included in dispersed recreation	
Water Yield MacFt	Minimum	0	0		
	Maximum	361	369	352	360

[1] The benchmark units and time periods shown were established in the 1987 plan EIS and were kept for this analysis.
[2] See explanation in range section below.

Methods

Timber/Forest Products

Based on current knowledge, possible alternatives for plan revision are expected to fall within previously established benchmarks set for sawtimber, net merchantable timber (sawtimber plus pulpwood), timber products (pulpwood), and firewood in the 1987 plan EIS. Current harvested volumes of these resources are lower than the predicted maximum benchmark and above the

minimum value of zero. Even considering alternatives that could include greater harvest levels, the forest timber sale contracting officer estimated that harvest volumes for sawtimber, net merchantable timber, products, and firewood would be well within the benchmarks established for the 1987 plan.

Cut and sold reports from 1987 to 2009 were reviewed in addition to projections for the timber-related products by Kim Newbauer, Coconino NF timber sale contracting officer. Comparisons between the 1987 plan EIS and current values are in table 2 and table 3. A summary of cut and sold reports is provided in appendix A of the "Draft Benchmark Analysis Report for Revision of the Coconino National Forest Plan" (USDA Forest Service 2010a). To compare benchmarks in alternatives B, C, and D, which use CCF as their unit of measure, and alternative A (1987 plan), which uses MBF, MCF and cords, both sets of measurements are displayed on the table using the conversion factors show in the footnotes.

Table 2. Comparison of past benchmarks to actual cut volume

Benchmark	Range	1987 Plan EIS Benchmark Projections		Actual Cut Volume
		Period 3 2001-2010	Period 4 2011-2020	Average 2001-2009
Net Sawtimber Volume Average Annual MBF/CCF[1]	Minimum	0	0	5,181/7,979
	Maximum	147,943/227,832	157,704/242,864	
Net Merchantable Timber Volume Average Annual CCF[1] (sawtimber plus pulpwood)	Minimum	0	0	16,390
	Maximum	298,010	343,870	
Products Volume Average Annual MBF and CCF[1](pulpwood)	Minimum	0	0	2,833/3,858

[1] Using a conversion factor for the Southwestern Region of pulpwood [5- 8.9" dbh] = 0.638mbf/1ccf, and sawtimber [9"+ dbh] = 0.46mbf/1ccf. To use these conversion, multiply MBF by (1+1/x):where x is the conversion number.

Table 3. Comparison of 1987 plan EIS benchmarks and actual cut volumes of firewood

Benchmark	Range	1987 Plan Benchmark Projections		Actual Cut Volume
		Period 3 2001-2010	Period 4 2011-2020	Average 2001-2009
Firewood (Average Annual Cords[1]/CCF[2])	Minimum	0	0	14,866/11,700
	Maximum	111,740/87,939	78,088/61,455	

[1] 1987 Plan EIS lists the units for firewood as MCords, however, based on our review of the 1987 cut and sold report, these values should have been cords, rather than thousands of cords.

[2] Conversion factors of 0.787 CCF per cord was used.

Current trends for sawtimber and pulpwood are expected to continue. However, three scenarios may affect future sawtimber, net merchantable timber, and timber product volumes over the next 10 years: (1) possible market upturn, (2) increase in biomass fuel production, and (3) the Four Forests Restoration Initiative.[27]

Market Upturn: If the economy improves and housing construction increases, the Coconino NF's timber program is anticipated to be similar to the levels existing from 2001 through 2008 (average annual volume of 5,181 MBF sawtimber and pulpwood). Based on recent sales, sawtimber is typically two-thirds of the volume and pulpwood is typically one-third of the volume. This translates to:

- 3,457 MBF sawtimber (5,185 MBF x 0.66)
- 1,728 MBF pulpwood or timber products (5,185 MBF x 0.33)
- 1,032 MCF net merchantable timber (5,185 MBF x 2 = 10,316 CCF/10)

Increase in Biomass Demand: If biomass becomes more economical as an alternative fuel, it is anticipated that demand for biomass material will increase substantially. For example, there is currently a proposal to use biomass to fuel a new cement plant at Drake, north of Prescott. A biofuel economy, that uses forest products, has the potential to increase the Coconino NF's program by approximately 30,000 to 50,000 CCF per year (15,000 to 25,000 MBF) of sawtimber and pulpwood. This translates to:

- 16,667 MBF sawtimber (25,000 MBF x 0.66)
- 8,333 MBF pulpwood or timber products (25,000 MBF x 0.33)
- 5,000 MCF net merchantable timber (25,000 MBF x 2 = 50,000 CCF/10)

Four Forest Restoration Initiative: General assumptions with potential volume from the Four Forests Restoration Initiative (4FRI) were used; these can be adjusted in the future if needed. It is assumed there would be no timber related volume from 4-FRI until 2014 when the project's NEPA documents would be completed and a contract would be awarded. It was assumed that once treatments commenced, an average of 30,000 acres per year would be treated and between 2014 and 2020 (period 4 in table 3), 70 percent of the acres or 21,000 acres per year would be treated on the Coconino NF, and the remaining treatment acres would be on the other national forests. Treatments would result in an average of 6 CCF per acre (based on the forest's current production averages) or 126,000 CCF (63,000 MBF) per year when treatments occur. The average annual volume for years 2011 to 2020 would be 44,100 MBF because no treatments would occur during the first four years due to NEPA document preparation. This translates to:

- 29,400 MBF sawtimber (44,100 MBF x 0.66)

[27] The Four Forest Restoration Initiative is a collaborative-based effort to increase spatial scales and decrease timeframes required to implement forest restoration efforts. It is planned to be conducted exclusively in ponderosa pine forests across northern Arizona, including the Kaibab, Coconino, Apache-Sitgreaves, and Tonto National Forests. The goal is to implement ecologically-designed treatments placed strategically across the landscape so to reduce the threat of landscape-scaled high severity wildland fire, reintroduce fires with planned ignitions, and support local wood products-based industries in surrounding communities.

- 14,700 MBF pulpwood or timber products (44,100 MBF x 0.33)
- 8,820 MCF net merchantable timber (44,100 MBF x 2 = 88,200 CCF/10)

Summary of Above Scenarios: If these possible scenarios are realized, the combined production totals are estimated as follows:

- 49,524 MBF sawtimber (3,457 + 16,667 + 29,400 MBF)
- 24,761 MBF pulpwood or timber products (1,728 + 8,333 + 14,700 MBF)
- 14,851 MCF net merchantable timber (1,031 + 5,000 + 8,820 MCF)

These totals are within the benchmarks established in the 1987 plan.

Firewood

With recent fossil fuel price increases there has been a surge in firewood demand. We assumed demand for firewood would continue to rise because of increasing emphasis on alternative energy and stable to increasing costs for home heating. We assumed the increase would be 300 MBF/year based on the difference between volume of firewood cut between 2001 and 2009 (4,731 to 8,007 MBF). Continuing on the current trend, we would expect 2020 firewood demand to be approximately 11,000 MBF (27,954 Cords). This is well within the projected minimum and maximum values from the 1987 EIS (see table 3).

Range

Since the 1987 plan, the Coconino NF has reduced the number and size of its allotments. In addition, stocking has been reduced in some areas. The result is a reduction of permitted use. Permitted use is expected to be lower than the previously established maximum benchmarks in periods 3 and 4 because of these reductions (table 4). When the 1987 plan was being created, permitted livestock use was closely aligned with capacity which was calculated using factors such as canopy cover and soil productivity. The Coconino NF no longer calculates capacity in the same way; instead permitted and authorized livestock use is derived using an adaptive management approach based on monitoring.

Table 4. Comparison of 1987 plan EIS range benchmarks and current data

Benchmark	Range	1987 Plan EIS Benchmark Projections		Current Use
		Period 3 2001-2010	Period 4 2011-2020	
Average annual MAUMs[1] Grazing Capacity	Minimum	0	0	Assumed within previously established benchmarks[2]
	Maximum	378	391	
Average annual MAUMs Permitted Use	Minimum	0	0	
	Maximum	358	378	2009 grazing year permitted use was 152.7

[1] Thousand aninmal unit months

[2] Per the previous explanation.

Recreation

National forest visits by site type were calculated using National Visitor Use Monitoring data converted into thousand recreation visitor days. We used 2005 NVUM data as a reasonable approximation of the average annual recreation use during the 2001 to 2010 time period. NVUM is the best available data available at this time. This is compared to 1987 Plan EIS benchmarks in table 5. As a surrogate for estimated future increases, we assumed that demand for recreation is closely tied to population levels. Since 1987, Arizona's population has increased at an average annual growth rate of 3.1 percent (USDA Forest Service 2010b). We estimated there would be a corresponding 3.1 percent annual increase in recreation demand for all three benchmarks (table 5). Actual changes in demand could vary according to changes in other social or economic variables.

The results of this approach indicate that wilderness MRVD values exceed maximum benchmark values in the 1987 plan EIS and our figures establish new maximum wilderness recreation benchmarks for period 3 and period 4. For developed recreation, our estimates suggest that minimum benchmark values are exceeded in period 3 and projected period 4 values fall within 1987 plan EIS benchmarks. Our projected dispersed recreation values fall within previously developed benchmark projections.

Table 5. Comparison of 1987 plan EIS recreation benchmarks and current data

Benchmark	Range	1987 Plan EIS Benchmark Projections of Average Annual Output		Estimated Average Outputs	
		Period 3[1] 2001-2010	Period 4[2] 2011-2020	Period 3[1] 2001-2010	Period 4[2] 2011-2020
Wilderness Recreation (MRVD)	Minimum	0	0		
	Maximum	60	88	89	123
Developed Recreation (MRVD)	Minimum	1,010	1,035		
	Maximum	2,460	1,708	857	1,185
Dispersed Recreation (MRVD)	Minimum	230	275		
	Maximum	2,128	2,422	1,717	2,375

[1] Period 3 (2001-2011) represents current data.

[2] Period 4 (2011-2020) represents a 3.1 percent annual increase

Calculations

Updated Assumption: These calculations were made using the original 2005 NVUM numbers that were released in 2006 (USDA Forest Service 2006). (Although the 2005 NVUM estimates have been revised in 2011, the estimated benchmarks would not have changed enough to change their relationship to the alternatives.)

Table 6 shows the recreation visitor day (RVD) values for 2000 and 2005. It also shows the 2005 values converted into MRVDs so they can be compared to the 1987 plan EIS. It was assumed that 2005 values would reasonably represent the average annual output for the 10 years represented by

period 3 (2001 to 2010). To get starting values for 2011 in period 4, a 3.1 percent annual increase was assumed between 2005 and 2010. Using this, the average RVDs for period 4 (2011 to 2020) was calculated assuming the 3.1 percent annual increase for each year; this is shown in table 7.

Table 6. Comparison of 2000 and 2005 recreation visitor days for Coconino NF

Site type	2000 RVDs	2005 RVDs (MRVDs)
Developed site	485,919	856,677 (857)
General Forest Area (undeveloped or dispersed areas)	1,727,423	1,716,910 (1,717)
Wilderness	97,314	89,213 (89)

Table 7. Estimated increase in recreation RVDs for periods 3 and 4

Year	Wilderness Recreation MRVDs	Developed Recreation MRVDs	Dispersed Recreation MRVDs	Notes
2005	89	857	1,717	NVUM data
2006	92	884	1,770	Assumed 3.1% increase
2007	95	911	1,825	Assumed 3.1% increase
2008	98	939	1,882	Assumed 3.1% increase
2009	101	968	1,940	Assumed 3.1% increase
2010	104	998	2,000	Assumed 3.1% increase
2011	107	1,029	2,062	Assumed 3.1% increase
2012	110	1,061	2,126	Assumed 3.1% increase
2013	114	1,094	2,192	Assumed 3.1% increase
2014	117	1,128	2,260	Assumed 3.1% increase
2015	121	1,163	2,330	Assumed 3.1% increase
2016	125	1,199	2,402	Assumed 3.1% increase
2017	128	1,236	2,477	Assumed 3.1% increase
2018	132	1,275	2,553	Assumed 3.1% increase
2019	136	1,314	2,633	Assumed 3.1% increase
2020	141	1,355	2,714	Assumed 3.1% increase
Average	123	1,185	2,375	For years 2011-2020

The more detailed calculations below show how day use and overnight use at developed sites were used to derive developed site RVDs. They also show how general forest area (GFA) equivalent of dispersed recreation and wilderness data were used.

A closer look at the 2000 and 2005 data suggests some general trends. For day use developed sites, there were more visits in 2005 than 2000 yet similar duration of stays. Overnight use developed sites had fewer visits in 2005 than but nearly twice the duration of stay. Consequently, the number of total developed site RVDs was higher in 2005 than 2000.

In contrast, there were many more "visits" in GFAs and wilderness areas by people who stayed much less time onsite or in the forest. GFA visits in 2005 were approximately triple the visits in 2000 (3,323,051 versus 1,108,507); while duration of stay was about one-third (18.7 hours in 2000 versus 6.2 hours in 2005). Therefore, RVDs were similar for both survey years.

Wilderness visits were up roughly 60 percent from 2000 to 2005, but duration of visits in wilderness areas were less than half in 2005 than in 2000. Therefore, wilderness RVDs were about 10 percent lower in 2005 than in 2000.

Summary of site visit calculations:

- 2005 Day Use Developed Sites (DUDS): 2,050,276 site visits, average duration of visit = 2.3 hours
- Overnight Use at Developed Sites (OUDS): 116,901 site visits, average duration of visit = 47.6 hours
- 2005 General Forest Areas (GFA): 3,323,051 site visits, average duration of visit = 6.2 hours (This calculation was considered to be equivalent to dispersed recreation, which included wildlife related activities.)
- 2005 Wilderness: 382,344 site visits, average duration of visit = 2.8 hours

A recreation visitor day (RVD) equals one 12-hour day for 1 person visiting the Coconino NF. Thus, 1 person visiting the forest for 12 hours equals 1 RVD.

Summary of RVD calculations:

- DUDS = total DUD visit x average duration of visit/12 hours = (2,050,276 visits x 2.3 hours)/12 hr = 392,970 RVDs
- OUDS = total OUDS visits x average duration of visit/12 = (116,901 visits x 47.6 hours)/12 hours = 463,707 RVDs
- Total Developed Site RVDs = 856,677 RVDs
- GFAs (undeveloped areas) = total undeveloped area visits x average duration of visits/12 = (3,323,051 visits x 6.2 hr)/12 = 1,716,910 RVDs
- Wilderness: total wilderness visits x average duration of visit/12 = (382,344 visits x 2.8 hr)/12 = **89,213 RVDs.** (For establishing the wilderness benchmark, an additional 30,000 visits were estimated based on the increased amount of wilderness under alternative C, equaling 96,214 RVDs.)

Summary of estimated benchmarks:

- Developed Site RVDs (DUDS + OUDS) = 856,677 or 857 MRVDs
- GFA RVDs = 1,716,910 or 1,716 MRVDs
- Wilderness = 96,214 or 97 MRVDs
- Total CNF RVDs = 2,669,801 or 2,670 MRVDs

Water Yield

Previously developed benchmarks were compared to estimated current and future water yields to evaluate whether benchmarks used in the 1987 plan were exceeded (table 8). Both current and future estimated water yields fall within the previously established benchmarks.

Table 8. Comparison of 1987 plan benchmarks and current data for water yield

Benchmark	Range	1987 Plan EIS Benchmark Projections		Current Projections (2010)	Future Projections
		Period 3 2001-2010	Period 4 2011-2020		
Water Yield (MacFt)	Minimum	325	325	Assumed similar	Assumed similar
	Maximum	361	369	352	360

Calculations were made using the same water yield formula used in the 1987 plan and compared against current water yield and anticipated yield from future vegetative treatments. Forest water yield in the 1987 plan EIS was calculated by determining the water yield for individual vegetation types; multiplying the water yield by the number of acres of each vegetation type, and summing the resulting value[28].

Only ponderosa pine water yield was evaluated for potential change because the majority of past treatments occurred in pine, and it was assumed the majority of future vegetative treatments would also occur in this type. All other water yields were adopted and added to Ponderosa pine water yield values from the 1987 plan (table 8) since no major treatments are proposed. It was assumed future Ponderosa pine vegetative treatments would occur at a rate of about 30,000 acres per year, reduce basal area to 95 square feet per acre, and potentially change water yield. Recent stream flow data from gauged sites indicates flow has been static or had a very slight decline over the last 10 years (USDA Forest Service 2009b) According to current forest plan specialist reports and research, water yield does not tend to decrease much above 120 basal area in ponderosa pine.

Summary of water yield in ponderosa pine:

- Current water yield AcFt = background value of 1987 plan – (1987 plan coefficient x average forest residual basal area) x acres ponderosa pine on forest

Assuming the estimated current (2010) basal area of ponderosa pine is 110, then…

Current water yield = 0.3958 – (0.001038 x 110 sq. ft/acre) = 0.282 AcFt/Yr x 534,540 ponderosa pine acres = **150,500 AcFt/Yr**

[28] Many assumptions and methods of determining water yield are based on the Guide for Determining Water Yield Improvement Opportunities (USDA Forest Service 1982). Water yield background values and associated coefficients for commercial forests were agreed upon by a soil and watershed workgroup in 1984 and were derived from research. Research includes from J.P. Potundy (USDA Forest Service 1982) and P. Jackson (USDA Forest Service 1984).

Assuming future average basal area of ponderosa pine is 95, then…

- Future water yield = 0.3958 – (0.001038 x 95sq. ft/acre) = 0.297 AcFt/Yr x 534,540 ponderosa pine acres = **158,800 AcFt/Yr**

At estimated treatments of 30,000 acres per year, Ponderosa pine basal area would probably be reduced to 60 and average about 95 square feet per acre forestwide. Forestwide water yield would increase to about 360 thousand acre feet per year in the short term for about up to 10 years and then decrease to current yield unless understory maintenance would occur that could keep water yield at this level. Table 9 compares the 1987plan with estimated current and future water yield values.

Table 9. Water yield by vegetation type and acres on the forest

Vegetation Type	Forest Acres	Coefficient	Water Yield (AcFt/Yr)		
			1987 Plan	Current	Future
Alpine	1382	0.910	1258		
Spruce Fir	18,927	0.698	13,211		
Mixed Conifer	73,069	0.550	40,188		
Ponderosa Pine	534,540	0.297	145,000	150,500	158,800
Grassland	214,029	0.178	37,669		
Pinyon-Juniper	736,850	0.075	55,264		
Riparian	25,136	1.038	26,091		
Open Water	8049	2.077	16,718		
Desert	218,755	0.040	8,750		
Chaparral	19,481	0.095	1,870		
Total			346,019	351,019	359,819

Summary for Evaluation of Alternatives using Plan Benchmarks

Timber/Forest Products

Estimated production for alternatives ranges from 41,251 CCF (alternative A) to 167,222 CCF (alternatives B, C and D) for sawtimber, and 5,804 CCF (alternative A) to 25,848CCF (alternatives B, C and D) for timber products (e.g., pulp, poles, and posts). All of these alternatives, therefore, fall within the benchmarks for timber and forest products.

Firewood

All alternatives were estimated to produce 13,687 CCF of firewood, which falls within the estimated benchmarks.

Range

There is no anticipated increase in animal unit months (AUMs) based on alternatives developed in the DEIS and, therefore, all alternatives fall within the benchmarks.

Recreation

The wilderness benchmark was adjusted up 30,000 visits based on the estimated increase in wilderness visitation in the "Social and Economic Report" for alternative C. Alternative C adds so much additional wilderness that it is assumed there will be a bump in visitation, especially because so much of it is within 90 minutes of the Phoenix metropolitan area.

For all the other recreation benchmarks, the expected visitation did not increase or decrease based on the alternatives developed.

Water Yield

It is estimated that overall forest water yield is static to slightly downward over the last 20 years due to analysis of streamflow water yield and the following two conditions:

- Greater tree and shrub basal area and canopy cover has been observed in several PNVTs and recorded over the last 20 years based on aerial photo analysis and the Anderson Mesa Landscape Scale Assessment Vegetation Group Specialist Report (USDA Forest Service 2004) which probably results in increased evapotranspiration and decreased runoff and water yield.
- Drought conditions have prevailed in most years since about 1999 and have probably contributed to decreased precipitation and runoff and water yield. Climatic conditions (e.g., drought) and vegetative conditions on the Little Colorado River watersheds are similar to the Verde River watersheds and, therefore, water yield trend is estimated to be similar (i.e., static to slightly downward).

Implementing objectives under alternatives B, C, and D could cause short-term increase in water yield to connected stream courses, springs, and groundwater, but they would be expected to last less than 10 years according to research (USDA Forest Service 1999).

The benchmark for period 4 reflects this expected trend for alternatives B, C, and D. Additionally, alternative A falls within the benchmark because current trends are expected to continue to be static to declining. All four alternatives fall within the water yield benchmarks.

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Appendix F. Forest Plan Language for Alternatives

This appendix provides specific plan language for alternatives C and D should either of those alternatives be chosen as the selected action in the record of decision. As described in detail below, under alternatives C or D, some of the existing alternative B plan language would be supplemented through additions, modifications, or replacements.

Alternative C

The changes in plan language related to alternative C are based on alternative C's retention of old growth direction from the 1987 plan and additional direction associated with research natural areas and the proposed wildlife habitat management areas. In addition to the changes in plan language for alternative C, two tables would need to be replaced. In the Recreation and Transportation Suitability Table (table 2), supplemental information reflects specifics of the proposed wildlife habitat management areas in this alternative (noted in ***bolded italics***). Furthermore, the creation of a new suitability table is also required to reflect changes in guidance related to recreational shooting (i.e., non-hunting shooting) and snowmobile use (see table 3). Alternative C minimizes disturbance in certain areas on the forest by delineating those specific areas as not suitable for recreational shooting (i.e., non-hunting shooting). Additionally, recreation settings with less noise disturbance would be promoted through restrictions on snowmobile use in certain areas on the forest. These changes in direction are reflected in the supplemental suitability table (table 3).

If alternative C is selected, the following plan changes would be made. The format of some of the following plan components may need to be restructured to be consistent with the rest of the proposed plan, but the content and intent would be retained.

Old Growth

This section identifies the changes that would occur if alternative C is selected and the old growth retention direction from the 1987 plan is incorporated into the proposed plan. Incorporating the old growth retention direction from the 1987 plan would be accomplished by adding some new components and modifying some existing components in the proposed plan. Some of the language from the 1987 plan uses language and terminology that is unclear when removed from the context of the 1987 plan or inconsistent with the remainder of the proposed plan. To resolve these problems, some of the plan language from the 1987 plan has been edited to align them with the proposed plan, while preserving the content and intent of those plan components. In other instances, components in the proposed plan would need to be modified to include new language related to old growth retention. The plan components listed below are labeled as additions (signifying that this is a new component being carried over from the 1987 plan) or modifications (signifying that this is a component from the proposed plan that has been edited to include direction from the 1987 plan). The edits to the added and modified plan components have been written in *italics*.

Changes to Glossary in the Proposed Plan

Addition: Allocation - The assignment of management prescriptions to particular land areas to achieve the goals and objectives of an alternative.

Changes to Vegetation Section in the Proposed Plan

Addition: Forestwide Forest and Woodland

Standard

Addition: *Old growth a*llocations will consist of landscape percentages meeting old growth conditions and not specific acres.

Guidelines

Addition: All analyses should be at multiple scales—one scale above and one scale below the ecosystem management areas. The amount of old growth *that* can be provided and maintained should be evaluated at the *6th code watershed* level and be based on PNVT, site capability, and disturbance regimes.

Addition: Old growth compositional, structural, and functional flow *should be created or sustained as much* as possible over time at multiple-area scales. Old growth *function should be developed or retained* on at least 20 percent of the naturally forested area by *forest and woodland PNVT* in any landscape *by 6th code watershed*.

Addition: The effects of spatial arrangement on old growth function *should be considered* from groups to landscapes, including de facto allocations to old growth such as goshawk nest sites, Mexican spotted owl protected activity centers, sites protected for species behavior associated with old growth, wilderness, research natural areas, and other forest structures managed for old growth function.

Addition: In allocating old growth and making decisions about old growth management, *current information should be used to evaluate* the relative risks to sustaining old growth function at the *multiple-area* scales, due to natural and human-caused events.

Addition: *Forest and woodland* sites should meet or exceed the structural attributes to be considered old growth in the *Piñon Juniper Evergreen Shrub, Piñon Juniper with Grass, Piñon Juniper Woodland, Ponderosa Pine, Mixed Conifer with Frequent Fire, Mixed Conifer with Aspen, and Spruce Fir PNVTs* in the Southwest as depicted in the table *Minimum Criteria for the Structural Attributes Used to Determine Old Growth*.

Addition: Greater density of snags *should be retained* adjacent to meadows, riparian areas, and key water sources to enhance habitat for snag-dependent species.

Management Approach

Addition: Use information about pre-European settlement conditions *or reference conditions* when considering the importance of various factors.

Addition: Use quantitative models when considering the importance of various factors. These models may include, but are not limited to: Forest Vegetation Simulator, BEHAVE, and FARSITE.

Addition: Areas managed for old growth, bear, and *Mexican* spotted owls *should be* the same.

Addition: New table. (Note the Aspen column has been deleted in table 1 below)

Table 1. Alternative C minimum criteria for the structural attributes used to determine old growth

PNVT	PJ Types		PP		MC Types		SF	
Site Capability	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**
Live Trees in Main Canopy:								
Trees/Acres	12	30	20	20	12	16	20	30
DBH/DRC	9”	12”	14”	18”	18”	20”	10”	14”
Age (Years)	150	200	180	180	150	150	140*/1 70**	140*/1 70**
Dead Trees								
Standing								
Trees/Acre	0.5*	1	1	1	2.5	2.5	3	4
Size DBH/DRC	9”	10”	14”	14”	14”	16”	12”	16”
Height (feet)	8’	10’	15’	25’	20’	25’	20’	30’
Down								
Pieces/Acre	2	2**	2	2	4	4	5	5
Size (Diameter)	9”	10”	12”	12”	12”	12”	12”	12”
Length (Feet)	8’	10’	15’	15’	16’	16’	16’	16’
Number of tree canopies* **	SS/MS	SS/MS	SS/MS	SS/MS	SS/MS	SS/MS	SS/MS	SS/MS
Total BA, Square Feet/Acre	6	24	70	90	80	100	120	140
Total Canopy Cover, Percent	20	35	40	50	50	60	60	70

*For Piñon Pine in *Piñon-Juniper PNVTs*: Dead limbs help make up dead material deficit. *For Spruce-Fir PNVT*: In mixed corkbark fir and Englemann spruce stands where Englemann spruce is less than 50 percent composition in the stand.
**For Piñon Pine in *Piñon-Juniper PNVTs*: Unless removed for firewood or fire burning activities. *For Spruce-Fir PNVT*: In mixed corkbark fir and Englemann spruce stands where Englemann spruce is less than 50 percent composition in the stand.
***SS is single-storied; and MS is multistoried

Changes to Piñon-Juniper PNVT Direction in Proposed Plan

Desired Conditions

Modification (in italics) of FW-Veg-PJ-PJG-DC-2 and FW-Veg-PJ-PJES-DC-2 : *In all Piñon-Juniper PNVTs, stands managed for old growth are at least 100 to 300 acres in size and greater than or equal to 330 feet wide or are in closely groups stands that provide contiguous habitat for interior dwelling species. Old growth components include old trees, dead trees (e.g.,*

snags), downed wood (e.g., coarse woody debris), and structural diversity. Old growth structure and snags are generally provided on slopes greater than 15 percent; however, snags may be provided on slopes less than 15 percent if requirements (as shown on table Minimum Criteria for the Structural Attributes Used to Determine Old Growth) for old growth characteristics (e.g., snags, downed logs, and old trees) cannot be met on the steeper slopes. The location of old growth shifts over time as a result of succession and disturbance (tree growth and mortality).

Addition: In all *Piñon-Juniper PNVTs*, most of the area greater than 15 percent slope is old growth and contains the snag component because it has not been cut and fire has been excluded. Old growth components include old trees, dead trees (snags), downed wood (coarse woody debris), and structural diversity.

Standard

Addition: Allocate no less than 20 percent of the *Piñon-Juniper PNVTs* in *each 6th code watershed* to old growth as depicted in the table *Minimum Criteria for the Structural Attributes Used to Determine Old Growth*.

Guideline

At least 20 percent of the area within 1,320 feet zone adjacent to pine stringers should be managed for dense mature or overmature stands of piñon-juniper.

Changes to Ponderosa Pine PNVT Direction in Proposed Plan

Desired Conditions

Modification (in italics) to FW-Veg-PP-DC-6: *In Ponderosa Pine PNVT, stands managed for old growth are at least 100 to 300 acres in size. In addition,* old growth structure occurs throughout the landscape, generally in small areas as individual old growth components, or as clumps of old growth. Consistent with vegetative characteristics of a frequent, low severity fire regime, old growth is a component of uneven-aged forests, generally comprised of groups of similarly aged trees and single trees interspersed with open grass-forb-shrub interspaces, but occasionally, it occurs in larger even-aged patches where local microsites facilitate less frequent fire regimes. Within group variability may be low but variation among groups is typically high and proportions of patches with different developmental stages may vary depending on site-specific conditions. Old growth components include old trees, dead trees (snags), and dead and downed wood (coarse woody debris including large size classes). Snags and large dead and downed fuels are irregularly distributed across the landscape and may not exist in some patches. The location of old growth components shifts on the landscape over time as a result of succession and disturbance (tree growth and mortality).

Modification (in italics) to FW-Veg-PP-DC-11: *For areas outside of old growth stands:* Ponderosa pine snags are typically 18 inches or greater at diameter at breast height (DBH) and average 1 to 2 snags per acre, but this can vary in space and time. (Snags per acre and logs per acre are general measures of abundance at the fine scale, and usually an average calculated from dated collected at the mid-scale or higher.) They are generally well-distributed to meet the needs of species that use snags and to provide for future downed logs. There are varying sizes of snags greater than 18 inches at DBH. Downed logs (greater than 12-inch diameter at mid-point and

greater than 8 feet long) average 3 logs per acre within the forested area of the landscape. Coarse woody debris, including large downed logs, is sufficient to maintain or improve long-term soil productivity and provide important wildlife habitat, and it is generally well-distributed and averages from 3 to 10 tons per acre. *For old growth stands: Using the table Minimum Criteria for the Structural Attributes Used to Determine Old Growth, in old growth stands, minimum attributes for snags are: 14 inches DBH, 15 feet tall (low sites) to 25 feet tall (high sites) and there is at least 1 snag per acre. They meet the needs of species that use snags and provide for future downed logs. In old growth stands, minimum attributes for downed logs are: 12 inch diameter at mid-point and 15 feet long and there is at least 2 downed logs per acre. Coarse woody debris, including large downed logs, is sufficient to maintain or improve long-term soil productivity and provide important wildlife habitat. Minimal total basal area ranges between 70 to 90 square feet per acre depending on site productivity and minimum total canopy cover ranges between 40 and 50 percent.*

Standard

Addition: Allocate no less than 20 percent of the *Ponderosa Pine PNVT* in *each 6th code watershed* to old growth as depicted in the table *Minimum Criteria for the Structural Attributes Used to Determine Old Growth*.

Changes to Mixed Conifer with Frequent Fire PNVT Direction in Proposed Plan

Desired Conditions

Modification (in italics) of FW-Veg-MCFF-DC-2: *In MCFF PNVT, stands managed for old growth are at least 100 to 300 acres in size. In addition,* old growth structure occurs throughout the landscape, generally in small areas as individual old growth components or as clumps of old growth. Old growth components include old trees, dead trees (snags), downed wood (coarse woody debris), and structural diversity. The location of old growth components shifts on the landscape over time as a result of succession and disturbance (tree growth and mortality). Old growth is often mixed with groups of younger trees or as individual groups of mostly old trees.

Modification (in italics) of FW-Veg-MCFF-DC-9: *In MCFF PNVT: For areas outside of old growth areas:* Snags are typically 18 inches or greater at DBH and average 3 per acre. (Snags per acre and logs per acre are general measures of abundance at the fine scale, land usually an average calculated form dated collected at the mid-scale or higher.) Downed logs (greater than 12 inch diameter at mid-point and greater than 8 feet long) average 3 per acre within the forested area of the landscape. (Snags per acre and logs per acre are general measures of abundance at the fine scale, land usually an average calculated form dated collected at the mid-scale or higher.)They are generally well-distributed to meet the needs of species that use snags and to provide for future downed logs. Coarse woody debris (greater than 3 inch diameter), including downed logs; ranges from 5 to 15 tons per acre to maintain long-term soil productivity and provide important wildlife habitat. *Using the following table Minimum Criteria for the Structural Attributes Used to Determine Old Growth, in old growth stands, minimum attributes for snags are: 14 to 16 inches diameter at breast height depending on site, 20 feet tall (low sites) to 25 feet tall (high sites) and there are at least 2.5 snags per acre. They meet the needs of species that use snags and provide for future downed logs. In old growth stands, minimum attributes for downed logs are: 12 inch diameter at mid-point and 16 feet long and there are at least 4 downed logs per acre. Coarse woody debris, including large downed logs, is sufficient to maintain or improve*

long-term soil productivity and provide important wildlife habitat. Minimal total basal area ranges between 80 to 100 square feet per acre depending on site productivity and minimum total canopy cover ranges between 50 and 60 percent.

Modification (in italics) of FW-Veg-MCFF-DC-13: Where they naturally occur, all age classes of aspen and maple are present in groups or patches and are regenerating and vigorous, *reflecting natural disturbance patterns and processes and at levels similar to or greater than those at the time of Plan approval. These patches collectively contribute to a variable-aged landscape, and are regenerating and vigorous.* A diverse understory comprised of native herbaceous and shrub species has a variety of seral and age classes and is vigorous and regenerating.

Standard

Addition: Allocate no less than 20 percent of the *Mixed Conifer with Frequent Fire PNVT* in each *6th code watershed* to old growth as depicted in the table *Minimum Criteria for the Structural Attributes Used to Determine Old Growth*.

Changes to Mixed Conifer with Aspen PNVT Direction in Proposed Plan

Desired Conditions

Modification (in italics) of FW-Veg-MC-MCA-DC-2: *In MCA PNVT, stands managed for old growth are at least 100 to 300 acres in size.* Old growth components include old trees, dead trees (snags), downed wood (coarse woody debris) and structural diversity. Old growth attributes are generally concentrated in old growth stands and the location of old growth stands shifts on the landscape over time as a result of succession and disturbance (tree growth and mortality).

Modification (in italics) of FW-Veg-MC-MCA-DC-3: Mixed Conifer with Aspen is composed predominantly of vigorous trees, but older declining trees are a component. Declining trees are well-distributed throughout the landscape, *including in aspen stands,* and provide for snags; top-killed, lightning-scarred and fire-scarred trees; and coarse woody debris. *For areas outside of old growth stands,* number of snags and the amount of downed logs (greater than 12 inch diameter at mid-point and greater than 8 feet long) and coarse woody debris (greater than 3 inch diameter) vary by seral stage *(areas inside old growth stands are described in FW-Veg-PP-DC-6)*

Modification (in italics) of FW-Veg MC-MCA-DC6: *For areas outside of old growth areas:* Tree density ranges from 20 to 180 square foot basal area per acre depending upon time since disturbance and seral stages of groups and patches. Snags 18 inches or greater at DBH average from 1 to 5 snags per acre, with the lower range of snags of this size associated with early seral stages and the upper range associated with late seral stages. Snag density in general (greater than 8 inches DBH) averages 20 per acre and provide wildlife habitat and future downed logs. Coarse woody debris, including downed logs, varies by seral stage, with averages ranging from 5 to 20 tons per acre for early seral stages; 20 to 40 tons per acre for mid-seral stages; and 35 tons per acre or greater for late-seral stages. Coarse woody debris and logs provide for long-term soil productivity. *Using the table Minimum Criteria for the Structural Attributes Used to Determine Old Growth, in old growth stands, minimum attributes for snags are: 14 to 16 inches diameter at breast height depending on site, 20 feet tall (low sites) to 25 feet tall (high sites) and there are at least 2.5 snags per acre. They meet the needs of species that use snags and provide for future downed logs. In old growth stands, minimum attributes for downed logs are: 12 inch diameter at*

mid-point and 16 feet long and there are at least 4 downed logs per acre. Coarse woody debris, including large downed logs, is sufficient to maintain or improve long-term soil productivity and provide important wildlife habitat. Minimal total basal area ranges between 80 to 100 square feet per acre depending on site productivity and minimum total canopy cover ranges between 50 and 60 percent. Direction is the same as for MCFF.

Modification (in italics) of FW-Veg-MCA-DC-7: Quaking aspen exists within the successional stage mosaic in this PNVT, providing habitat for those organisms dependent on it. Organisms present in aspen groves include native plant species such as the Colorado blue columbine and Rusby milkvetch, native animals such as woodpeckers, and a variety of fungi and microorganisms. Where they naturally occur, all age classes of aspen and maple are present in even-aged groups or patches *reflecting natural disturbance patterns and processes and at levels similar to or greater than those at the time of Plan approval.* These patches collectively contribute to a variable-aged landscape, and are regenerating and vigorous. A diverse understory comprised of native herbaceous and shrub species has a variety of seral and age classes and is vigorous and regenerating.

Standard

Addition: Allocate no less than 20 percent of the *Mixed Conifer with Aspen PNVT* in *each 6th code watershed* to old growth as depicted in the table *Minimum Criteria for the Structural Attributes Used to Determine Old Growth*.

Changes to Spruce Fir PNVT Direction in the Proposed Plan

Desired Conditions

Modification (in italics) of FW-Veg-SF-DC-3: *In Spruce Fir PNVT, stands managed for old growth are at least 100 to 300 acres in size.* Old growth characteristics generally occur over large areas as stands or patches where old growth components are concentrated. Old growth components include old trees, dead trees (snags), downed wood (coarse woody debris) and structural diversity. The location of old growth components shifts on the landscape over time as a result of succession and disturbance (tree growth and mortality).

Modification (in italics) of FW-Veg-SF-DC-4: Spruce Fir is composed predominantly of vigorous trees, but older declining trees are a component. Declining trees are well-distributed throughout the landscape, *including in aspen,* and provide for snags; top-killed, lightning-scarred and fire-scarred trees; and coarse woody debris. Number of snags and the amount of downed logs (greater than 12 inch-diameter at mid-point and greater than 8 feet long) and coarse woody debris (greater than 3-inch diameter) vary by seral stage.

Modification (in italics) of FW-Veg-SF-DC-8: Aspen is occasionally present in large patches providing habitat for those organisms dependent on it. Organisms present in aspen groves include native plant species such as the Colorado blue columbine and Rusby milkvetch, native animals such as woodpeckers, and a variety of fungi and microorganisms. *Where they naturally occur, all age classes of aspen are present in even-aged groups or patches reflecting natural disturbance patterns and processes. These patches collectively contribute to a variable-aged landscape, and are regenerating and vigorous. A diverse understory comprised of native herbaceous and shrub species has a variety of seral and age classes and is vigorous and regenerating.*

Modification (in italics) of FW-Veg-SF-DC-9: Tree density ranges from 20 to 250 square foot basal area per acre, depending upon disturbance and seral stages of the groups and patches. *For areas outside of old growth stands:* Snags 18 inches or greater at DBH range from 1 to 3 snags per acre, with the lower range of snags this size associated with early seral stages and the upper range associated with late seral stages. Snag density in general (greater than 8-inches DBH) averages 20 per acre with a range of 13 to 30 and provides habitat for wildlife species and future downed logs. Coarse woody debris, including downed logs, averages vary by seral stage, ranging from 5 to 30 tons per acre for early seral stages; 30 to 40 tons per acre for mid-seral stages; and 40 tons per acre or greater for late-seral stages and provide for long-term soil productivity. *Using the table Minimum Criteria for the Structural Attributes Used to Determine Old Growth in old growth stand, the minimum attributes for snags are: 12 to 16 inches diameter at breast height depending on site, 20 feet tall (low sites) to 30 feet tall (high sites) and there is at least 3 to 4 snags per acre. They meet the needs of species that use snags and provide for future downed logs. In old growth stands, minimum attributes for downed logs are: 12 inch diameter at mid-point and 16 feet long and there are at least 5 downed logs per acre. Coarse woody debris, including large downed logs, is sufficient to maintain or improve long-term soil productivity and provide important wildlife habitat. Minimal total basal area ranges between 120 to 140 square feet per acre depending on site productivity and minimum total canopy cover ranges between 60 and 70 percent.*

Standard

Addition: Allocate no less than 20 percent of the *Spruce Fir PNVT* in *each 6th code watershed* to old growth as depicted in the table *Minimum Criteria for the Structural Attributes Used to Determine Old Growth*.

Changes to Research Natural Area Direction in the Proposed Plan

Guideline

Addition: Livestock grazing should be excluded from research natural areas unless grazing supports or would not affect the area's research purpose.

Changes to Wildlife Habitat Management Area Direction in Proposed Plan

This section identifies the changes that would occur if alternative C is selected and the direction developed for wildlife habitat management areas is incorporated into the proposed Plan. All of the plan direction for wildlife habitat management areas would be additions to the proposed Plan.

General Description for Wildlife Habitat Management Areas

Wildlife habitat management areas (WHMAs) provide additional protection for wildlife, vegetation, watersheds, and headwater environments. WHMAs emphasize maintenance and restoration of native species in natural patterns of abundance and distribution and provide management direction for long-term protection of significant wildlife habitat, including watersheds and headwater environments. WHMA designation provides a low-disturbance wildlife habitat for native wildlife species, and it allows for improved wildlife habitat, including habitat connectivity, and protection of water quality and soil, vegetation, and water resources by further limiting motor vehicle traffic. Roads on the boundaries of WHMAs and those listed in desired conditions provide access and are excluded from motor vehicle traffic restrictions.

For scenery desired conditions for WHMAs, see the Upper Clear Creek Management Area, with the exceptions of Jacks Canyon and Pine Grove. For scenery desired conditions for Jacks Canyon, see the Anderson Mesa Management Area; for Pine Grove, see Pine Belt Management Area. Management direction for PNVTs that fall within the management areas applies unless otherwise stated below.

Desired Conditions for Wildlife Habitat Management Areas

The ecological integrity of watersheds, headwater environments, native vegetation, and soils is intact and functioning. Streams and perennial waters support identified designated beneficial uses. Old growth in the Ponderosa Pine and Mixed Conifer PNVTs is protected during management activities. Old growth stands and riparian corridors found within WHMAs provide biologically significant cores and corridors for wildlife and fish through the landscape. Within WHMAs, wildlife habitats are properly functioning and natural fire regimes are established in appropriate soil and vegetation types. In addition, soils function properly, the understory provides sufficient habitat and cover for wildlife, evidence of past logging is negligible and few roads are present. Fire management mimics natural fire processes. Within WHMAs, springs, streams, and wetlands are protected and restored. Additionally, stands of aspen and big leaf maple are present and properly functioning, adding value to both habitat diversity and scenic integrity of WHMAs.

Within the East Clear Creek, Hospital Ridge, Knoll Lake, Limestone Pasture and Second Chance WHMAs, the watersheds that support Leonard Canyon and East Clear Creek, including the headwaters, are protected and restored. Within the Anderson Mesa WHMA, the watersheds that support Mormon, Young's, Padre, and Anderson Canyons are protected and restored. Within the Pine Grove WHMA, the Upper Lake Mary watershed is protected and restored.

Low-disturbance, non-motorized recreation, such as wildlife watching and birding, fishing, hunting, horseback riding, mountain-biking, and hiking, dominates these areas and does not negatively impact soil conditions, hydrologic flow, or habitat connectivity of the WHMA in which it occurs. Campground loop roads are open to the public with applicable seasonal closures associated with the facility.

Mexican spotted owl, Northern goshawk, mountain lion, Abert's squirrel, pronghorn, cinnamon teal, aquatic macro-invertebrates, mule deer, Gunnison prairie dog and associated community, migratory wetland birds, Yellow-breasted chat, and the Lincoln sparrow are emphasized and able to find properly functioning and restored habitats within the **Anderson Mesa WHMA**[29]. Pine stringers, grasslands, wetlands, and the Piñon Juniper PNVTs are important habitat features in this WHMA. The understory is diverse and provides hiding cover for pronghorn fawns. Forbs and shrubs provide forage for mule deer and pronghorn.

Little Colorado spinedace, Northern and Chiricahua leopard frogs, beaver, Mexican spotted owl, Northern goshawk, black bear, mountain lion, Abert's squirrel, mule deer, elk, forest-dependent birds, and turkey are emphasized and able to find properly functioning and restored habitat within the **East Clear Creek WHMA**.

[29] All the direction that applied to the Anderson Mesa MA in alternative B also applies to this WHMA.

Little Colorado spinedace, Mexican spotted owl, Northern goshawk, black bear, mountain lion, and Abert's squirrel are emphasized and able to find properly functioning and restored habitats within the **Hospital Ridge WHMA**. This WHMA provides protection for the health and functioning of the Upper Clear Creek watershed, West and Middle Leonard Canyons, and adjoining riparian ecosystems.

Jack's Canyon WHMA offers long-term protection of river and stream corridors. Habitat for the Mexican spotted owl, Northern goshawk, black bear, mountain lion, Abert's squirrel, and pronghorn are emphasized.

Little Colorado spinedace, Mexican spotted owl, Northern goshawk, black bear, mountain lion, and Abert's squirrel are emphasized and able to find properly functioning and restored habitats within the **Knoll Lake WHMA** . The East Clear Creek watershed and East Leonard Canyon ecosystem are protected and properly functioning within the boundaries of the WHMA.

Black bear, mountain lion, northern goshawk, and Abert's squirrel are emphasized and able to find properly functioning and restored habitat within the **Limestone Pasture WHMA**. The Upper Clear Creek watershed, native vegetation, and soils of this headwater region are protected and properly functioning within the boundaries of the WHMA.

Mexican spotted owl, northern goshawk, mountain lion, and the Abert's squirrel are emphasized and able to find properly functioning and restored habitat within the **Pine Grove WHMA**, which also offers protection for the Upper Lake Mary watershed.

Northern Goshawk is emphasized and able to find properly functioning and restored habitat within the **Second Chance WHMA**. The Upper Clear Creek watershed, native vegetation, and soils of this headwater region are protected and properly functioning within the boundaries of the WHMA.

Guidelines for Wildlife Habitat Management Areas

- There should be no net increase in the area of motorized dispersed camping corridors designated within each WHMA. The purpose is to limit soil, vegetation, and noise disturbances to wildlife species and habitat emphasized within the WMHA.
- Roads that provide public access should be limited in order to minimize impacts from motorized vehicle traffic to wildlife emphasized in the WHMAs and their associated habitats. Public access should be provided to the following areas:
    - In East Clear Creek WHMA, roads that access developed sites, trailheads and interpretive, roads that provide recreation access to the CC Cragin Reservoir, and improved and maintained roads providing connectivity from State Highway 87 to the Rim Road (FR 300).
    - In the Jack's Canyon WHMA, roads that access developed sites, trailheads, and interpretive sites.
    - In Knoll Lake WHMA, roads that access developed sites, trailheads, and interpretive sites.
- In Second Chance, Limestone Pasture, Pine Grove, and Hospital Ridge WHMAs, public motor vehicle access should not be provided.

- All roads within WHMAs that are not open for public access should be managed for administrative use or decommissioned.
- Through future projects and other actions, public road density throughout Anderson Mesa WHMA should not exceed an average of 1 mile of road per square mile.[30]
- To avoid impacts to wildlife and associated habitats, large group recreation events and large commercial tours within WHMAs should not be permitted except in developed sites and in support of research.

Management Approaches for Wildlife Habitat Management Areas

- Collaborate with interested groups to monitor improved function of the resource for which each WHMA was designated.

[30] Road density should be based on the ratio between roads open to public access and acres of Forest Service-managed lands for Anderson Mesa WHMA. This ratio should be calculated at the WHMA level not at the site specific and project level scales.

Tables Associated with Alternative C to be replaced in the Proposed Plan

Table 2. Alternative C recreation and transportation suitability[1]

Recreation Opportunity Spectrum (ROS) and Special Area Designations	New Motorized Areas	NFS Roads and Motorized Trails > 50"	NFS Motorized Trails < 50"	Temporary Roads	Permanent Roads	Mechanized Travel	Non-Motorized Travel
Urban and Rural ROS	Suitable	Suitable	Suitable	Suitable	Suitable	Suitable	Suitable
Roaded Natural ROS	Suitable	Suitable	Suitable	Suitable	Suitable	Suitable	Suitable
Semi-Primitive Motorized ROS	Not Suitable	Suitable	Suitable	Suitable	Suitable	Suitable	Suitable
Semi-Primitive Nonmotorized ROS	Not Suitable	Not Suitable	Not Suitable	Suitable	Not Suitable	Suitable	Suitable
Primitive ROS	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Suitable	Suitable
Recommended Research Natural Area	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Suitable
Research Natural Area	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Suitable
Botanical and Geological Areas	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Suitable
Environmental Study Areas	Not Suitable	Not Suitable	Not Suitable	Suitable	Not Suitable	Suitable	Suitable
Recommended Wilderness	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Suitable	Suitable
Wilderness	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Suitable
Eligible or Designated WSR – Recreation and Scenic	Not Suitable	Suitable	Suitable	Suitable	Suitable	Suitable	Suitable
Eligible or Designated WSR – Wild	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Suitable	Suitable
Wildlife Habitat Management Areas	***Not Suitable***	***Not Suitable***	***Not Suitable***	***Suitable***	***Suitable***	***Suitable***	***Suitable***

[1] Table changes based on alternative C guidance are noted in ***bolded italics.***

Table 3. Alternative C recreational shooting[1] and snowmobile use suitability

Recreation Opportunity Spectrum (ROS) and Special Area Designations	Recreational Shooting	Snowmobile Use
Urban and Rural ROS	Suitable	Suitable
Roaded Natural ROS	Suitable	Suitable
Semiprimitve Motorized ROS	Suitable	Suitable
Semiprimitive Nonmotorized ROS	Suitable	Not Suitable
Primitive ROS	Suitable	Not Suitable
Recommended Research Natural Area	Not Suitable	See ROS
Research Natural Area	Not Suitable	See ROS
Botanical and Geological Areas	Not Suitable	See ROS
Recommended Wilderness	Suitable	See ROS
Wilderness	Suitable	See ROS
Eligible or suitable wild and scenic river	Suitable	See ROS
Wildlife Habitat Management Areas	Not Suitable	See ROS
Walnut Canyon MA	Not Suitable	Not Suitable
Sedona Neighborwoods MA	Not Suitable	See ROS
Flagstaff Neighborwoods MA	Suitable[2]	See ROS
Long Valley MA	Not Suitable	See ROS

[1] Recreational shooting refers to target shooting; it does not include shooting for hunting.

[2] Parts of the Flagstaff Neighborwoods in proximity to private property may not be suitable for recreational shooting. This determination should be made through project-level NEPA.

Alternative D

One of the themes in alternative D is to accommodate wider utility corridors where there are existing lines (see Scenic Integrity Objectives map in appendix A). However, desired conditions would not be met for three congressionally designated special areas by expanding the corridor in its existing location. Thus, the following guideline addresses that situation. There is only one replacement necessary in alternative B plan language should alternative D be chosen as the Selected Action—a change in the Recreation and Transportation Suitability Table (table 4). In alternative B, mechanized travel is "not suitable" within botanical and geological areas, but because alternative D would allow mechanized recreation on designated trails in botanical and geological areas, the Recreation and Transportation Suitability Table for alternative D would be changed to reflect this difference (noted in ***bolded italics*** below).

If alternative D is selected, the following plan changes would be made.

Infrastructure

Guideline for Lands Special Uses

Addition: Any reroute of powerlines or expansion of capacity for existing power line corridors should avoid or reduce scenic impacts to the West Clear Creek Wilderness and the Verde and Fossil Creek Wild and Scenic Rivers. Projects that avoid these areas but cause impacts to scenery elsewhere may change Scenic Integrity Objectives to "Moderate" or "Low."

Table Associated with Alternative D to be Replaced in the Proposed Plan

Table 4. Alternative D recreation and transportation suitability

Recreation Opportunity Spectrum (ROS) and Special Area Designations	New Motorized Areas	NFS Roads and Motorized Trails > 50"	NFS Motorized Trails < 50"	Temporary Roads	Permanent Roads	Mechanized Travel	Non-Motorized Travel
Urban and Rural ROS	Suitable	Suitable	Suitable	Suitable	Suitable	Suitable	Suitable
Roaded Natural ROS	Suitable	Suitable	Suitable	Suitable	Suitable	Suitable	Suitable
Semiprimitive Motorized ROS	Not Suitable	Suitable	Suitable	Suitable	Suitable	Suitable	Suitable
Semiprimitive Nonmotorized ROS	Not Suitable	Not Suitable	Not Suitable	Suitable	Not Suitable	Suitable	Suitable
Primitive ROS	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Suitable	Suitable
Recommended Research Natural Area	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Suitable
Research Natural Area	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Suitable
Botanical and Geological Areas	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Not Suitable	***Suitable[2]***	Suitable
Environmental Study Areas	Not Suitable	Not Suitable	Not Suitable	Suitable	Not Suitable	Suitable	Suitable
Recommended Wilderness	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Suitable	Suitable
Wilderness	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Suitable
Eligible or Designated WSR – Recreation and Scenic	Not Suitable	Suitable	Suitable	Suitable	Suitable	Suitable	Suitable
Eligible or Designated WSR – Wild	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Suitable	Suitable

[1] Table changes based on alternative D guidance are noted in ***bolded italics***.

[2] On designated trails only.

Appendix G. Timber Sale Schedule, Financial Evaluation, Allowable Sale Quantity, Long Term Sustained Yield, and Timber Suitability Calculation

Timber Suitability Calculation

The National Forest Management Act (NFMA) requires the agency to determine the suitability of National Forest System (NFS) lands for timber production and has specific requirements for timber suitability analysis in land management plans. The agency makes a distinction between timber harvest as a resource use (hereinafter called, timber production) and timber harvest as a management tool to achieve desired conditions; definitions are provided in the following discussion.

Determining Lands Tentatively Suitable for Timber Production

The general analysis process first identifies lands tentatively suitable for timber production (USDA Forest Service 2012a):

- Screens are applied to identify "lands tentatively suitable for timber production." The following features are removed from the total acres of the forest (see Table 1):
    - Non-Forested Land
    - Lands where timber production would cause irreversible resource damage
    - Lands that cannot be adequately restocked
    - Lands that have been administratively withdrawn
- "Lands tentatively suitable for timber production" are then reviewed to determine whether they are "suitable for timber production" or "not suitable for timber production." These suitability determinations may vary by plan alternative. Analysis of alternatives allows the responsible official to identify where timber production is compatible with the desired conditions resulting from the land management planning process. The timber production objective is defined as growing, tending, harvesting, and regenerating crops of trees on a regulated basis to produce logs or other products for industrial or consumer use [1982 rule provisions section 219.16].
- Lands are identified as "suitable for timber production" if meeting and sustaining desired conditions and objectives would involve planned, periodic timber harvest activities and also include planned regeneration of the stand. Timber production may not be a key management objective for the area. However, if periodic forest harvest and regeneration would either be consistent with or necessary for achieving and maintaining land management goals and desired conditions (e.g., fuels conditions, wildlife habitat), these lands should be classified as suitable for timber production. Designation of "Lands Suitable for Timber Production" does not imply that management would be focused on maximizing timber yields, only that periodic harvests are expected to occur as a tool for meeting land condition outcomes.
- "Lands not suitable for timber production" are determined through the forest plan analysis of alternatives process. These are lands where periodic timber harvest is

unpredictable, unnecessary, or undesirable to achieve management goals, but harvest is permitted where necessary to achieve plan or project-level resource objectives. Timber harvest is not scheduled as a periodic activity on these lands, and Long Term Sustained Yield Calculation (LTSYC) and Allowable Sale Quantity (ASQ) calculations do not apply.

Timber components codes (TimCo), vegetation cover type from the vegetation sites GIS layer, and existing wilderness areas were used to classify lands into the five categories of lands Not Suitable for Timber Production (table 1). TimCos are codes assigned to each stand in the vegetation database that identify areas of suitability or non-suitability for timber management and also identify areas of management for activities other than timber management. (For more detailed descriptions of TimCo codes, see the Rocky Mountain Resource Information System (RMRIS) Data Dictionary, Appendix 12, 2002.) The Coconino NF has made updates to this database since the 1987 plan was approved; changes in management or site-specific information was made where a need to change suitability was indicated based on project-level analysis.

Table 1. Categories of Lands Not Suitable for Timber Production and specific attributes used to classify these categories

Not Suitable Category	TimCo	Description
Non-Forest Lands	001	Water
	100	Water
	200	Non-Forest
	900	Non-Industrial Wood - Incapable of Producing Industrial Wood
	970	Non-Industrial Wood - Woodland Not Suited for Management
Withdrawn Lands	300	Existing Wilderness Areas
	301	Unsuitable Forest Land - Wilderness
	302	Unsuitable Forest Land - Research Natural Areas
	303	Withdrawn - Other
	400	Pending Final Legislative Action
Irreversible Resource Damage	700	Unsuitable Forest Land - Timberland
	720	Current Techniques Prevent Harvesting (e.g., steep slopes)
	730	Irreversible Resource Damage (e.g., soil loss)
	740	Lacking Response Data
Adequate Restocking not Assured	710	Restocking Not Assured Within 5 Years (e.g., naturally open areas due to microclimates)

Table 2 lists the acres removed from the Coconino NF-managed land base, by land category, to determine the “Lands Tentatively Suitable for Timber Production.” Because the lands in these

categories have physical or regulatory limitations that apply regardless of how the lands may be managed, the acres in these categories will not vary by alternative. The next screen in this process, to determine Tentatively Suitable Lands Not Appropriate for Timber Production, takes into account how management varies by the alternatives being considered.

Table 2. Calculation of acres of land tentatively suitable for timber production by alternative

Land Category	Acres for All Alternatives
All Coconino NF Lands	**1,851,626**
Non forested	-992,224
Withdrawn lands	-113,857
Irreversible resource damage	-48,633
Adequate restocking not assured	-80,074
Lands Tentatively Suitable for Timber Production	**616,838**

Determining Lands Not Appropriate for Timber Production and Final Suitability by Alternative

In order to determine Lands Suitable for Timber Production, lands that are determined to be not appropriate for timber production are removed from the lands that have been identified as tentatively suitable for timber production. Areas not appropriate for timber production are those that are either not desirable or not feasible to manage for periodic harvests of forest products. Lands Not Appropriate for Timber Production include: lands where Management Prescriptions Preclude Timber Production, Management Requirements Cannot be Met, and where it would be Not Cost Efficient in Meeting Timber Objectives.

Each alternative identified areas of land where management prescriptions preclude timber production. All alternatives identified lands incompatible with multiple use - Critical Wildlife Habitat - Threatened and Endangered Wildlife such as: Protected Activity Centers (PACs) for Mexican spotted owls (TimCo 800 and 801); lands incompatible with multiple use-Critical Wildlife Habitat-Old Growth (TimCo 803); and lands incompatible with multiple use - Experimental Forest, Range, or watershed (TimCo 810). Alternative B included the lands within three recommended wilderness areas (TimCo 301). Alternative C included the lands within 13 recommended wilderness areas (TimCo 301) and lands incompatible with multiple use and Old Growth (TimCo 803).

In addition, areas of land were identified as not cost efficient in meeting timber objectives due to the excessive costs (e.g., road construction) and low/negative returns associated with timber harvesting (e.g., preparation/logging costs) and removal (e.g., haul costs). These include small lands with low product value (TimCo 850), high road construction costs (TimCo 860), high logging costs (TimCo 880), and isolated patches of commercial timberland (TimCo 870). These were the same for all alternatives.

For example, road construction costs range from $15,000 to $25,000 per mile compared to re-construction costs for existing roads that range between $5,000 and $8,000 per mile. Once new

roads are constructed, they must be either maintained at an average cost of $500 to $800 per mile each decade or be obliterated and seeded at an estimated cost of $2,000 per mile. In many of these areas, harvest volumes are low and harvest preparation and logging costs are excessively high. When ground-based mechanical (tractor) logging is not feasible and other harvesting systems (e.g., cable/helicopter) are required, logging costs generally increase by 200 to 300 percent (MSU 2006). In areas that would have very high operating costs, regular entry for purposes of timber production is not financially feasible.

Lands Not Appropriate for Timber Production varied by alternative and the specifics are displayed in table 3.

Table 3. Categories of Lands Not Appropriate for Timber Production and the alternative-specific attributes that would result in lands not appropriate

Category of Lands Not Appropriate for Timber Production	TimCo	TimCo Description	Areas by Alternative			
			A	B	C	D
Management Prescriptions Preclude Timber Production	800 and 801	Incompatible With Multiple Use - Critical Wildlife Habitat	MSO PACs			
	803	Incompatible With Multiple Use - Critical Wildlife Habitat - Old Growth	Allocated Developing and Existing Old Growth	NA	Allocated Developing and Existing Old Growth	NA
	810	Incompatible With Multiple Use - Experimental Forest, Range, or Watershed	Same for all Alternatives			
	301	Unsuitable Forest Land - Wilderness	NA	3 Rec. Wilderness Areas	13 Rec. Wilderness Areas	NA
	302	Unsuitable Forest Land - Research Natural Areas	NA	New Research Natural Areas		
Not Cost Efficient in Meeting Timber Objectives[1]	850	Cost Efficiency - Low Product Value	Same for all Alternatives			
	860	Cost Efficiency - Road Construction Problems	Same for all Alternatives			
	870	Cost Efficiency - Isolated Patch of Forest Land	Same for all Alternatives			
	880	Cost Efficiency - High Logging Cost	Same for all Alternatives			
Lands Where Management Requirements Cannot be Met	NA					

[1] See Financial Evaluation section that follows for additional details on cost efficiency.

For each alternative:

Lands Suitable for Timber Production equals (=)
Lands Tentatively Suitable for Timber Production minus (-)
Tentatively Lands Not Appropriate for Timber Production

Acres of Lands Not Appropriate for Timber Production were calculated for each category by alternative (table 4). Negative values indicate acres not appropriate for timber production that were removed from the Lands Tentatively Suitable for Timber Production.

Table 4. Calculations for acres of lands not appropriate for timber production by alternative

Land Category	Acres by Alternative			
	A	B	C	D
Tentatively suitable for timber production	616,838	616,838	616,838	616,838
Management prescriptions preclude timber production	-143,747	-80,281	-144,797	-80,281
Not cost efficient in meeting timber objectives[1]	-8,876	-8,876	-8,876	-8,876
Management requirements cannot be met	0	0	0	0
Subtotal: Not appropriate for timber production	-464,215	-89,157	-153,673	-89,157
Suitable for timber production	**464,215**	**527,681**	**463,165**	**527,681**
Not suitable for timber production	**1,387,411**	**1,323,945**	**1,388,461**	**1,323,945**

[1] See "Financial Evaluation" section that follows for additional details on cost efficiency.

Financial Evaluation

The planning rule provisions at Section 219.14(b) require that tentatively suitable forest lands shall be further reviewed and assessed to determine the costs and benefits for a range of management intensities for timber production. To meet this requirement, the Coconino NF used the Financial Evaluation 219.14b spreadsheet (Timber Feasibility Analysis) provided by the Southwestern Regional Office that may be found in the project record. The spreadsheet incorporates information regarding harvest volumes, revenues, and costs over time to calculate the per acre present net value (PNV) and benefit/cost ratios at discount rates of 3, 4, and 7 percent (table 5 and table 6). This was completed based on the guidelines contained in plan alternatives for those acres identified as tentatively suitable. The results from this financial evaluation were combined with other categories that relate to Lands Tentatively Suitable for Timber Production as part of the effort to determine Lands Suitable for Timber Production (see table 2 and table 3 above).

The management intensities/prescriptions applied in alternatives and analyzed are (1) free thin all sizes to target basal area (BA) of 50 and (2) group select with matrix thin to target BA of 60 (Ponderosa Pine) or 70 square feet per acre (Mixed Conifer with Frequent Fire). These intensities/prescriptions were applied to three different operational scenarios for Ponderosa Pine

and Mixed Conifer with Frequent Fire PNVTs: Tractor ground – roaded, Tractor ground – unroaded, and Cable/Helicopter ground. Tractor-roaded includes all tentatively suitable acres within a quarter of a mile of the nearest road. Tractor-unroaded includes all tentatively suitable acres greater than a quarter of a mile from the nearest road. Cable/Helicopter ground includes all tentatively suitable acres on slopes greater than 40 percent.

Volumes were based on the average yield per acre from the calculations based on acres treated for the Ponderosa Pine and Mixed Conifer with Frequent Fire PNVTs (see table 5 and table 6 below). Revenues per thousand cubic feet (mcf) were based on the Transaction Evidence Appraisal (TEA) Bulletin #1, Calendar Year 12, 4th Quarter (January). Costs included harvest preparation and administration, fuel treatment, stocking surveys, stand release (prescribed burns), non-merchantable thins, necessary mitigation, and roads (reconstruction and maintenance). Under these cost and revenue assumptions, all estimated net revenues were negative. Management on Tractor ground – roaded produced the lowest negative (i.e., most positive) net values. All operational scenarios produced positive benefit/cost ratios except Cable/helicopter ground.

Table 5. Per acre present net value (PNV) and benefit/cost ratios for Ponderosa Pine

Combination Free Thin - Group Selection	Percent Net Revenue	Benefit/Cost Ratio
	Tractor Ground - Roaded	
Undiscounted net revenue	-$2,938.56	0.47
PNV at 3%	-$751.05	0.54
PNV at 4%	-$587.56	0.56
PNV at 7%	-$371.40	0.61
	Tractor Ground - Unroaded	
Undiscounted net revenue	-$5,207.07	0.077
PNV at 3%	-$1,623.75	0.084
PNV at 4%	-$1,350.51	0.086
PNV at 7%	-$990.60	0.089
	Cable/Helicopter Ground	
Undiscounted net revenue	-$18,492.66	-0.039
PNV at 3%	-$5,501.84	-0.046
PNV at 4%	-$4,501.96	-0.047
PNV at 7%	-$3,185.81	-0.051

Table 6. Per acre present net value (PNV) and benefit/cost ratios for Mixed Conifer

Combination Free Thin - Group Selection	Percent Net Revenue	Benefit/Cost Ratio
Tractor Ground - Roaded		
Undiscounted net revenue	-$5,962.34	0.019
PNV at 3%	-$1,766.11	0.021
PNV at 4%	-$1,445.10	0.022
PNV at 7%	-$1,022.66	0.024
Tractor Ground - Unroaded		
Undiscounted net revenue	-$5,638.08	0.00059
PNV at 3%	-$1,771.46	0.00063
PNV at 4%	-$1,475.95	0.00064
PNV at 7%	-$1,086.86	0.00067
Cable/Helicopter Ground		
Undiscounted net revenue	-$19,337.16	-0.0022
PNV at 3%	-$5,288.59	-0.0027
PNV at 4%	-$4,312.82	-0.0028
PNV at 7%	-$3,039.07	-0.0030

The planning rule provisions at Section 219.14(c) require a consideration of costs and benefits for alternative management of the lands as identified in 219.14.b. Management prescriptions (in this case for timber harvest) shall be defined **to meet management objectives** for the various multiple uses including outdoor recreation, timber, watershed, range, wildlife and fish, and wilderness. It should be noted that in alternatives B, C, and D, there are no objectives for timber output (MBF, MCF, or CCF), but there are objectives for acres of mechanical treatment. Unlike the 1987 plan, alternatives B, C, and D are focused on *outcomes*, not *outputs*. Movement toward desired conditions and resilient landscapes is more valuable than revenue received.

Lands were identified as Suitable for Timber Production if achieving and maintaining the desired conditions and objectives would involve planned, periodic timber harvest activities and also would include planned regeneration of the stand. Designation of Lands Suitable for Timber Production does not imply that management will be focused on maximizing timber yields, only that periodic harvests are expected to occur as a tool for achieving or maintaining desired conditions (USDA Forest Service 2012a).

The plan Need for Change relative to the mechanical harvest of trees is under Maintenance and Improvement of Ecosystem Health:

- Incorporate desired conditions that reflect the composition, structure, and natural disturbance attributes appropriate for the different ecosystems and that are integrated across different resource areas.

The provisions at Section 219.12(f)(8) state that each alternative shall represent to the extent practicable the most cost efficient combination of management prescriptions examined that can *meet the objectives established in the alternative.*

By producing the least negative net revenue, the combination of free thin all sizes to target BA of 50 and group selection with matrix thin to a target BA of 60 square feet per acre for Ponderosa Pine on roaded, tractor ground is the most cost efficient combination of management prescriptions (Table 5).

Long Term Sustained Yield Calculation (LTSYC)

Lands designated as suitable for timber production provide the base for calculating the LTSYC of the forest. These lands can either be designated by mapping or they can be expressed as a percentage of the lands classed as Tentatively Suitable for Timber Production. The latter approach assumes that within larger areas that are classed Suitable for Timber Production, there may be scattered inclusions of areas that are more appropriately managed as Unsuitable for Timber Production lands.

During plan development or plan revision and, as appropriate, for plan amendment, the responsible official shall estimate the amount of timber that could be harvested annually in perpetuity on a sustained-yield basis from land where timber harvest could occur, once these lands are in their desired condition.

LTSY is computed based upon the premise that periodic harvest and regeneration is desired or necessary to meet land management desired conditions. Desired conditions are based upon multiple use objectives. Highest potential yield was not an objective in any alternative. The cutting methods and silvicultural management strategy used for these calculations are consistent with the stated land management objectives.

NFMA states that the Secretary of Agriculture shall assure that plans for forest management provide for multiple use and sustained yield of the products and services obtained therefrom in accordance with the Multiple-Use, Sustained-Yield Act of 1960, and in particular, include coordination of outdoor recreation, range, timber, watershed, wildlife and fish, and wilderness. ‘‘Sustained yield of the products and services’’ means the perpetual achievement and maintenance of a high annual level, or regular periodic, output of the various renewable resources of the national forests without impairment of the productivity of the land. NFMA requires the agency to estimate, in the land management plan, the amount of commercial wood products that may be sustainably harvested over a long period. This sustainable harvest estimate assumes that lands are already in their desired condition. In reality, most forest lands are not in a desired condition so planners use mathematical models to estimate sustainable harvest levels and show planned progress towards the achievement of desired conditions and LTSYC levels of harvest. Short-term harvest levels on lands where timber production is a regular, predictable activity would tend to steadily increase or decrease until those lands are at a desired condition and then remain steady around that level.

Coconino NF Approach to LTSYC Analysis

Desired conditions, and their contributions to social, economic, and ecological sustainability, are the vision that drives the forest plan revision and implementation process; for example, see the

following sample of citations describing the 1982 planning rule procedures taken from National Forest System Land and Resource Management Planning,36 CFR § 219 (1999):

- Sec 219.11: "Forest Plan Content. The Forest Plan shall contain the following…Forest multiple-use goals and objectives that include a description of the desired future condition of the forest or grassland…."
- Sec 219.1 "Purpose and principles.
  - (a)(1) "The resulting plans shall provide for multiple use and sustained yield of goods and services from the National Forest System in a way that maximizes long term net public benefits in an environmentally sound manner."
  - (b)(1) "Establishment of goals and objectives for multiple-use and sustained-yield management of renewable resources without impairment of the productivity of the land;
  - (b)(2) "Consideration of the relative values of all renewable resources, including the relationship of nonrenewable resources, such as minerals, to renewable resources;
  - (b)(3) "Recognition that the National Forests are ecosystems and their management for goods and services requires an awareness and consideration of the interrelationships among plants, animals, soil, water, air, and other environmental factors within such ecosystems;
  - (b)(4) "Protection and, where appropriate, improvement of the quality of renewable resources…."

Based upon this direction, the Southwestern Region has adopted a regionally consistent set of desired condition visions for forested PNVTs. Due to these common desired condition visions, it is reasonable to analyze LTSYC in a consistent fashion for all national forests in the Southwestern Region. For this effort, alternatives B and D rely on this set of desired conditions. However, alternatives A and C differ in that they retain the old growth direction from the 1987 plan, requiring at least 20 percent of the naturally forested area by forest type in any landscape be developed to retain old growth function. Because these forested areas would be managed to retain a minimum of twenty 18-inch trees per acre with at least 90 square feet of basal area per acre and 50 percent canopy cover, they were removed from the suitable timber base. Management for these conditions differs from the regionally consistent desired conditions which strive to create uneven-aged structure and maintain old growth attributes across the landscape, not just on 20 percent. The LTSYC for alternatives A and C apply to the 80 percent not to be managed specifically for old growth. The 20 percent to be managed for old growth was removed from suitable timberlands and was not included in the LTSYC. The following assumptions were used as the basis for the Coconino NF's LTSYC analyses for all alternatives.

LTSYC calculations are based upon uneven-aged forest management systems for the following forest PNVTs on the Coconino NF:

- Ponderosa Pine Forest (PPF) and its subtypes (PP-Grass and PP-Gambel oak)
- Mixed Conifer with Frequent Fire (assumes management favors retention of shade intolerant species)
- Mixed Conifer with Aspen (assumes management favors retention of wind-firm species; Douglas-fir, Southwestern white pine, although other species are represented and desired)

The uneven-aged management strategy assumed the following in its analysis:

- Group selection cutting in mid and very large diameter states
- For Ponderosa Pine types, high site index: 5 age groups, 40-year cutting cycle, 20-year intermediate thinning, 60 basal area target matrix density target matrix[31] density varies by PNVT (e.g., Mixed Conifer with Frequent Fire has a 70 basal area target matrix density).

Analysis methods used included:

- Regionwide Forest Inventory Analysis (FIA) plot data, sorted by PNVT and site index
- Forest Vegetation Simulator (FVS) – regionally calibrated
- Mortality
- Growth
- Seen defect
- Merchantable cubic feet volumes (5-inch+ DBH, 4-inch minimum top DIB[32])
- Merchantable board feet volumes (9-inch+ DBH, 6-inch minimum top DIB)

Overview/Assumptions:

Long Term-Sustained Yield Capacity (LTSYC) is a theoretical calculation based upon achieving a regulated[33] uneven-aged condition across the landscape, meaning that there would be more or less balanced age classes, from young to old, at desired densities that are able to cycle through time maintaining the desired uneven-aged distribution (i.e. , even-flow). Each subsequent harvest entry (approximately every 20 years) would strive to adjust stocking levels to continue to move toward desired conditions. LTSYC is based upon harvest volumes derived from Forest Inventory Analysis (FIA) data averaged across the Southwestern Region, and the percentage of high versus low site quality index of Ponderosa Pine acres across the forest.

Site quality (index) for Ponderosa Pine forestwide was determined by looking at Field Sampled Vegetation (FSVeg) and Forest Inventory Analysis (FIA) data taken over the past decade. Using a site index of 70 (Minor) as the break between high and low sites, 1,382 out of 1,641 stands (84 percent) in FSVeg rated as high site quality; while only 62 out of 202 FIA plots (31 percent) rated as high site quality. Because of budgetary constraints, data collected for FSVeg is typically concentrated in higher site quality stands that have a greater chance for treatment on the ground. Because of this, it is believed that the FSVeg number of 84 percent is distorted to the high side.

[31] In uneven-aged silviculture, "matrix" refers to the forested area surrounding regeneration groups (group selection) that receives thinning each cutting cycle until it is time to be regenerated again. The matrix accounts for the bulk of a stand or harvest area.

[32] DIB stands for diameter inside bark, which provides for more accurate calculation of tree volume by subtracting bark thickness from the calculation.

[33] The technical (in contrast to the administrative and business) aspects of controlling stocking, harvests, growth, and yields to meet management objectives including sustained yield. A direct method of controlling and determining the amount of timber to be cut annually or periodically by calculations based on growing stock volume and increment. Society of American Foresters Online Dictionary (http://www.dictionaryofforestry.org/dict/term/forest_regulation) accessed November 1, 2011.

Conversely, FIA data is a much coarser sample that puts no weight on site quality; thus, even unproductive timberlands are sampled. When averaged together, the high versus low site ratio is 78:22, which was rounded down to a 75 percent high site quality index across the forest. The LTSY was calculated assuming that 75 percent of the Ponderosa Pine PNVT is capable of growing 22.5 cubic feet per acre per year, and 25 percent is capable of growing 15.5 cubic feet per acre per year.

Allowable Sale Quantity

NFMA at section 13 (Limitations on timber removal) and the 1982 planning rule provisions at Section 219.16 (Timber resource sale schedule) require that timber harvest levels be based on the principle of sustained yield. Long-term sustained yield (LTSY) is the uniform wood yield from lands being managed for timber production that may be sustained under a specified management intensity that is consistent with multiple-use objectives. Allowable sale quantity (ASQ) is the quantity of timber that is planned to be sold from the suitable timberland covered by the forest plan for a time period specified by the plan. ASQ is usually expressed on an annual basis as the "average annual allowable sale quantity" because it may be exceeded in a given year as long as the 10-year average is not exceeded. ASQ and LTSYC apply only to those lands that are suitable for timber production where there is intent to have regular harvests for the purpose of producing commercial timber products, as well as management for other resource objectives."

These provisions allow for the establishment of an ASQ to depart from (exceed) the projected LTSY provided that such planned departure is consistent with and leads to the better attainment of multiple use management objectives.

The Ponderosa Pine and Mixed Conifer with Frequent Fire PNVTs are highly departed in terms of density, structure, and susceptibility to unnaturally high-severity crown fire. To make progress toward desired conditions for these PNVTs, timber harvest levels will have to be significantly greater than the estimated LTSY until such time as desired conditions (e.g., reduced tree density, uneven-aged structure, reduced crown fire risk) are attained. LTSY is roughly equivalent to growth/production that can be sustained over time. However, LTSY is only applicable once the desired density and structure have been achieved.

LTSY calculation guidance provided by the Southwestern Region (USDA Forest Service 2012a) was used for the Coconino NFLTSY estimates. Table 7 displays the ASQ and LTSY for each alternative.

Table 7. Allowable Sale Quantity and Long-term Sustained Yield, Volumes (CCF1) by alternative

	Alternative A	Alternatives B and D	Alternative C
Allowable Sale Quantity	84,348 CCF	194,162 CCF	194,162 CCF
Long-Term Sustained Yield	102,910 CCF	114,773 CCF	100,457 CCF

[1] CCF = one hundred cubic feet

Alternatives A

Alternative A is projected to be below the LTSYC (10.3 million CF per decade) for the next 5 decades. Existing forest conditions are dominated by single storied (even-aged), closed canopy

states consisting of primarily medium sized (10- to 20-inch DBH) trees. Simulated treatments of uneven-aged group selection and free thinning were modeled using a plan objective of 10,000 acres per year. This alternative would sustain harvests at approximately 10.3 million cubic feet per decade for the first 10 years, and then slowly decline. The sale quantity would fall short of the LTSYC in the first 2 decades because an insufficient number of the overstocked acres would be treated. The first 2 decades would reduce stand densities and starts the landscape on an uneven-aged trajectory moving toward desired conditions, but not enough acres would be treated to reach the LTSY. Over the following 3 decades, structure would continue to slowly adjust, but the proportion of open, uneven-aged states would remain far below the closed, even-aged states. Because of existing overstocked forest condition and high level of departure, the treatment objective of 10,000 acres would not achieve the LTSY or desired condition in 5 decades.

Alternatives B, C, and D

Alternatives B, C, and D are projected to be well above the LTSYC (11.5 million CF per decade for alternatives B and D, and 10.05 million for alternative C) for the next 5 decades. Existing forest conditions are dominated by single storied (even-aged), closed canopy states consisting of primarily medium sized (10- to 20-inch DBH) trees. Simulated treatments of uneven-aged group selection and free thinning would sustain harvests at approximately 19 million cubic feet per decade for the first 10 years and then slowly decline. Based upon the objective of silviculturally treating 26,050 acres per year, much of the overstocked acres would be treated in the first 2 decades, which is partially why the sale quantity exceeds the LTSYC by such a large margin. The first 2 decades would reduce stand densities and starts the landscape on an uneven-aged trajectory moving toward desired conditions. Over the following 3 decades, structure would continue to be adjusted as the proportion of open, uneven-aged states begins to equal the closed even-aged states and the sale quantity begins to level off at about 15 million CF per decade. Because of existing overstocked forest conditions and high level of departure, it may take 80 to100 years to reach regulation (USDA Forest Service 2012a) and desired conditions. Suitable timberlands are currently denser, less structurally diverse, and more prone to crown fires than desired. As a result, alternatives B, C, and D have an ASQ that is higher than LTSY. This planned departure from the LTSY will be necessary through the next century to achieve the desired density and structure consistent with other multiple-use objectives (**Figure G-** 1).

Figure G- 1 assumes full capacity to implement mechanical thinning at the rate identified in the objectives in the proposed revised plan. Actual capacity may be limited due to lack of infrastructure, budget, or successful project planning. Although the estimated number of years in each phase of departure would vary depending on the actual implementation rates, the pattern is expected to remain roughly the same. The total time from plan implementation to achievement of the desired density and structure is estimated at approximately 100 years, with a minimum of 20 years between treatments designed to achieve uneven-aged structure. Note that due to the current lack of infrastructure, the volumes during the first period may actually start below the ASQ and climb before flattening out at or near the ASQ.

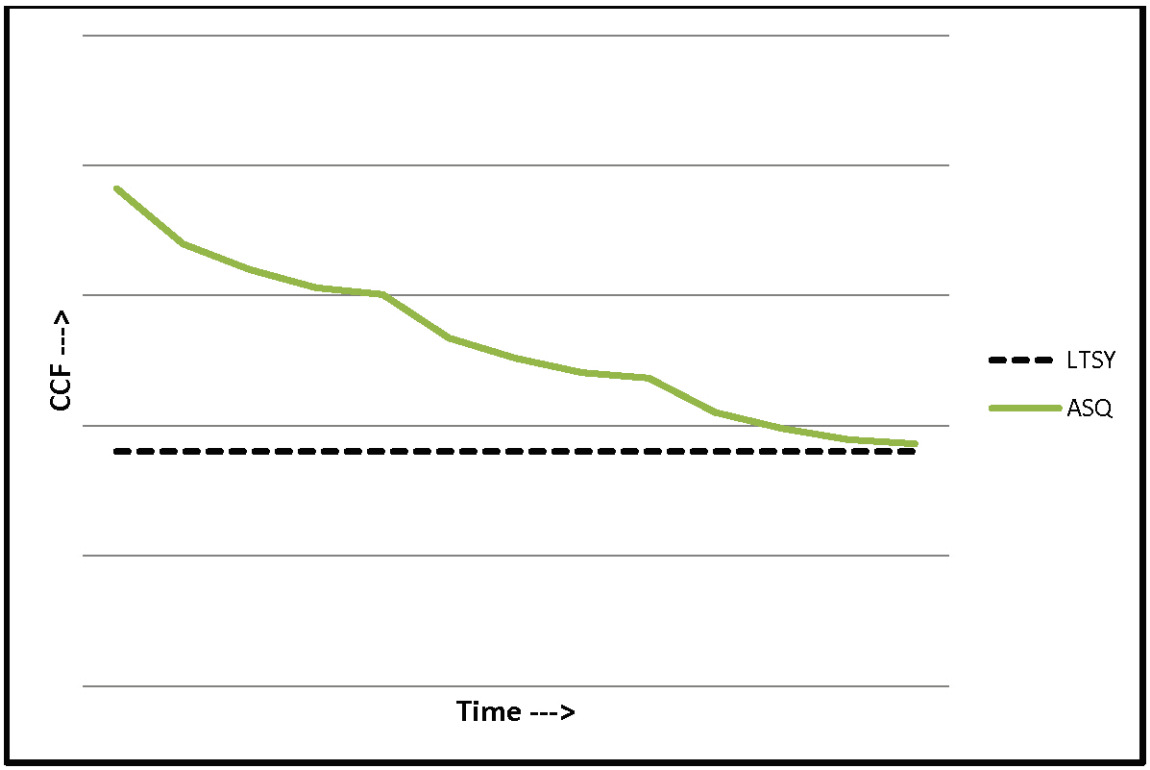

Figure G- 1. Estimated departure pattern between ASQ and LTSY for alternatives B, C, and D

Initially, the forest would focus mechanical thinning efforts in the areas most at risk of loss. These are the areas containing the greatest percentage of dense states that are dominated by trees in the larger size classes. These states are given higher priority because they are at risk of loss from uncharacteristic high intensity wildfire, and it would take longer to replace the larger trees if they are lost (more than 100 years). The uneven-aged dense states dominated by large trees could potentially be treated to the desired open, uneven-aged state in one treatment. Once the desired density and structure is achieved, the areas would no longer contribute to the vegetative departure. Following the initial treatments in the even-aged, dense, large tree dominated sites; the desired density would be achieved. However, these areas would not have the desired uneven-aged structure, even with the new age cohort (regeneration) that would result from the initial treatment. These two-aged areas would be scheduled for additional treatments to regenerate additional cohorts, creating desired uneven-aged conditions.

Once all of the suitable areas in the dense, large tree states (H, I, L, and M) have had one treatment (minimum of 25 years), the volume would drop and stabilize for another 1 or 2 decades, even though the implementation rate for mechanical restoration would be similar to the first period. During this second phase, the original dense even-aged states would receive a second treatment establishing new regeneration, and the younger dense states (F and G) would receive their first treatments. While implementation rates are expected to be stable, lower yields would likely result because the smaller dense states yield about half the volume of the larger states and because the intensity of treatments on the second treatment of the areas in the larger states is expected to be lower than the first treatment. With a second treatment establishing a third age

class, most of these stands would be in the desired uneven-aged, open state and would no longer contribute to the departure.

In the third phase, the volumes would drop again to just above the LTSY level and then taper off to a zero departure, where harvest/ASQ would be equal to LTSYC. During this last phase of departure, the areas with one or two age classes would receive their final restructuring treatments to establish regeneration and reduce density which would release the largest trees (component most lacking) so that they may grow more quickly and achieve the desired larger diameters. When all suitable timberlands are in the desired open, uneven-aged condition, the yield of wood produced and harvested would stabilize at the identified LTSY. All treatments thereafter would focus on maintaining the desired conditions over time, while yielding a sustainable supply of wood in perpetuity.

Note that commercial wood volume may be produced from restoration treatments or other management to meet resource objectives on non-suitable timberlands. On non-suitable timberlands, mechanical thinning would only be used to achieve the desired stand structure and density. Thereafter, the desired density would be maintained with fire. There is no long-term sustained yield or allowable sale quantity assigned to non-suitable areas.

Tables 8 through 13 display ASQ calculations for the Ponderosa Pine and Mixed Conifer with Frequent Fire PNVTs for the proposed revised plan (alternative B), based on the VDDT Analysis described in the Vegetation and Fire Specialist Report (USDA Forest Service 2012b).

Key for VDDT States in table 8 through table 14:

C_SMO = small, open;

D_MOS = medium, open, single story;

E_VOS = very large, open, single story;

F_SSC = seedling/sapling, closed;

G_SMC = small, closed;

H_MCS = medium, closed, single story;

I_VCS = very large, closed, single story;

J_MOM = medium, open, multistory;

K_VOM = very large, open, multistory;

L_MCM = medium, closed, multistory;

M_VCM = very large, closed, multistory.

Table 8. Average yield per acre (CF) in Ponderosa Pine PNVT, by prescription, by applicable VDDT State (1st Decade)

	C_SMO	D_MOS	E_VOS	F_SSC	G_SMC	H_MCS	I_VCS	J_MOM	K_VOM	L_MCM	M_VCM
Free thin all sizes to target BA											
5 - 9" DBH (CF) for ASQ Calcs	978,495	0	0	461,179	2,543,890	0	0	0	0	0	0
9+" DBH (CF) for ASQ Calcs	46,543	0	0	1,518,241	2,295,933	0	0	0	0	0	0
GroupSelect with matrix thin											
5 - 9" DBH (CF) for ASQ Calcs	0	272,837	0	0	0	12,337,884	116,709	454,972	97,531	6,879,111	582,667
9+" DBH (CF) for ASQ Calcs	0	1,703,726	2,108,812	0	0	57,109,524	19,747,377	8,953,357	11,759,674	44,049,577	10,159,614

Table 9. Average annual acres treated, in Ponderosa Pine PNVT, by prescription, by applicable VDDT State (1st Decade)

	C_SMO	D_MOS	E_VOS	F_SSC	G_SMC	H_MCS	I_VCS	J_MOM	K_VOM	L_MCM	M_VCM
Free thin all sizes to target BA	2,636	0	0	479	719	0	0	0	0	0	0
GroupSelect with matrix thin	0	839	359	0	0	7,548	1,198	2,276	1,917	4,792	719

Table 10. Average annual yield (cubic feet), in Ponderosa Pine PNVT, by prescription, by applicable VDDT State

	C_SMO	D_MOS	E_VOS	F_SSC	G_SMC	H_MCS	I_VCS	J_MOM	K_VOM	L_MCM	M_VCM
Free thin all sizes to target BA											
5 - 9" DBH (CF) for ASQ Calcs	97,850	0	0	46,118	254,389	0	0	0	0	0	0
9+" DBH (CF) for ASQ Calcs	4,654	0	0	151,824	229,593	0	0	0	0	0	0
GroupSelect with matrix thin											
5 - 9" DBH (CF) for ASQ Calcs	0	27,284	0	0	0	1,233,788	11,671	45,497	9,753	687,911	58,267
9+" DBH (CF) for ASQ Calcs	0	170,373	210,881	0	0	5,710,952	1,974,738	895,336	1,175,967	4,404,958	1,015,961

Table 11. Average yield per acre (CF) in Mixed Conifer FF PNVT, by prescription, by applicable VDDT State (1st Decade)

	C_SMO	D_MOS	E_VOS	F_SSC	G_SMC	H_MCS	I_VCS	J_MOM	K_VOM	L_MCM	M_VCM
Free thin all sizes to target BA											
5 - 9" DBH (CF) for ASQ Calcs	0	0	0	0	24,029	269,848	0	0	0	0	0
9+" DBH (CF) for ASQ Calcs	0	173	0	0	266,427	454,234	0	0	0	0	0
GroupSelect with matrix thin											
5 - 9" DBH (CF) for ASQ Calcs	0	0	0	0	0	0	301,251	0	16,000	0	587,095
9+" DBH (CF) for ASQ Calcs	0	0	9100	0	0	0	1,736,977	658,059	66,624	638,654	3,625,981

Table 12. Average annual acres treated, in Mixed Conifer FF PNVT, by prescription, by applicable VDDT State

	C_SMO	D_MOS	E_VOS	F_SSC	G_SMC	H_MCS	I_VCS	J_MOM	K_VOM	L_MCM	M_VCM
Free thin all sizes to target BA	0	7	0	0	65	1,09	0	0	0	0	0
GroupSelect with matrix thin	0	0	29	0	0	0	2,32	43	1,01	1,74	5,51

Table 13. Average annual yield (cubic feet), in Mixed Conifer FF, by prescription, by applicable VDDT State

	C_SMO	D_MOS	E_VOS	F_SSC	G_SMC	H_MCS	I_VCS	J_MOM	K_VOM	L_MCM	M_VCM
Free thin all sizes to target BA											
5 - 9" DBH (CF) for ASQ Calcs	0	0	0	0	2,403	26,985	0	0	0	0	0
9+" DBH (CF) for ASQ Calcs	0	17	0	0	26,643	45,423	0	0	0	0	0
GroupSelect with matrix thin											
5 - 9" DBH (CF) for ASQ Calcs	0	0	0	0	0	0	30,125	0	1,600	0	58,710
9+" DBH (CF) for ASQ Calcs	0	0	910	0	0	0	173,698	65,806	6,662	63,865	362,598

Timber Sale Schedule

The timber sale schedule for the Coconino NF is formulated to provide for a forest structure that will enable perpetual timber harvest which meets the principle of sustained-yield and multiple-use objectives of the alternative (1982 planning rule, section 219.16 (a)(2)(iv)). For the base sale schedules, the planned sale for any future decade shall be equal to, or greater than, the planned sale for the preceding decade, provided that the planned sale is not greater than the long-term sustained-yield capacity consistent with the management objectives of the alternative (section 219.16 (a)(1). Alternatives with sale schedules which depart from the principles of paragraph (a)(1) of this section and which will lead to better attaining the overall objectives of multiple-use management shall be evaluated when any of the following conditions are indicated:

- (i) None of the other alternatives considered provides a sale schedule that achieves the assigned goals of the RPA Program as provided in Sec. 219.4(b);
- (ii) High mortality losses from any cause can be significantly reduced or prevented or forest age-class distribution can be improved, thereby facilitating future sustained-yield management; or
- (iii) Implementation of the corresponding base sale schedule would cause a substantial adverse impact upon a community in the economic area in which the forest is located.
- (iv) It is reasonable to expect that overall multiple-use objectives would otherwise be better attained.
- Conditions (ii) and (iv) both apply to the Coconino National Forest.

Table 14 below outlines the expected maximum harvest volumes for the Coconino NF for the 10 years following plan approval. The total of these volumes is the allowable sale quantity (ASQ). For the first decade, the ASQ is 1,941,616 CCF.

Table 14. Expected maximum harvest levels

Vegetation Type	Acres	Pulp (CCF)	Saw (CCF)	Total (CCF)
Ponderosa Pine	234,823	247,253	1,594,524	1,841,777
Mixed Conifer with Frequent Fire	14,410	12,161	87,678	99,839
Totals	**249,233**	**259,414**	**1,682,202**	**1,941,616**

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U.S. Department of Agriculture (USDA), Forest Service. 2012b. Vegetation and Fire Specialist Report Forest Plan Revision DEIS. Flagstaff, AZ: Coconino National Forest.

Appendix H. Index of Other Supporting EIS Documentation

Document	Location
Analysis of the Management Situation (AMS)	Coconino National Forest Plan Revision Project Web Page
Ecological Sustainability Report (ESR)	Coconino National Forest Plan Revision Project Web Page
Economic and Social Sustainability Assessment (ESSA)	Coconino National Forest Plan Revision Project Web Page
Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds on the Coconino, Kaibab, and Prescott National Forests	Coconino National Forest Plan Revision Project Web Page
Southwestern Region Climate Change Trends and Forest Planning	Coconino National Forest Plan Revision Project Web Page
Potential Wilderness Area Evalution	Coconino National Forest Plan Revision Project Web Page
Wild and Scenic River Eligibility Evaluation	Coconino National Forest Plan Revision Project Web Page
Research Natural Areas Evaluations	Coconino National Forest Plan Revision Project Web Page
Specialists Reports for the Draft Environmental Impact Statement	Coconino National Forest Plan Revision Project Web Page